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ARNOLDIA



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ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 1

MARCH 14, 1941

NUMBER 1

A SIMPLE CHANGE IN NAME

OUR "Bulletin of Popular Information" has always been an unsatisfactory periodical to cite, because of the form of its title, which reads: "Arnold Arboretum, Harvard University, Bulletin of Popular Information." Moreover, for no very obvious reason, in the twenty-nine years of its publication it has attained four series, and for clarity it is necessary to cite the series as well as the volume. Initiated in May, 1911, sixty-three unpagcd numbers form the first series, this run closing in November, 1914. In 1915, a new series was commenced with volume one and was continued for twelve years, closing with volume twelve in December, 1926. Series three was initiated with volume one in 1927, and closed with volume six in 1932. The fourth and last series was commenced with volume one in 1933, and was closed with volume eight in 1940.

In scanning the many thousands of entries in such a comprehensive reference work as the "Union List of Serials in Libraries of the United States and Canada," one notes that an overwhelming majority of the periodical titles stress the name of the sponsoring organization in their titles, whether published by a society or an institution. My attitude is that in general a single name is better than a long and cumbersome title, and in many cases single name titles would have established and maintained the institutional or organizational prestige just as well as the longer explanatory title—and, of course, would be infinitely simpler to cite. One unnecessarily long title that I replaced with a single word one was the following: "University of California Publications. The Agricultural Experiment Station of the College of Agriculture Technical Paper No.—." In 1925, this series was closed and the new

title "Hilgardia" was selected, with an explanatory subtitle, "A Journal of Agricultural Science published by the California Agricultural Experiment Station," to replace the "Technical Bulletin" series with the long and cumbersome name, and "Hilgardia," named in honor of the first Director of the California Agricultural Experiment Station is now in its thirteenth volume. In 1931, a new technical periodical was established at the New York Botanical Garden, and for this the single word name "Brittonia" was selected in honor of the first Director of the Garden, Dr. Nathaniel Lord Britton, with an explanatory subtitle, "A Series of Botanical Papers published by the New York Botanical Garden."¹ And now the old name of our Bulletin of Popular Information is replaced with a one word title "Arnoldia" honoring Mr. James Arnold whose initial bequest of \$100,000.00 in 1868 lead to the establishment of the Arnold Arboretum in 1872.²

In the short paper referred to above on one-name periodicals, about forty ; one-word or essentially one-word titles for well-known technical periodicals are listed where the name itself indicated the general field of the publication. Following this, another series of about forty one-name titles is given, where the names were, for the most part, derived from those of individuals prominent in botanical and horticultural science, such as "Adansonia," "Bonplandia," "Candollea," "Grevillea," "Hedwigia," "Linnaea," "Malpighia," "Sieboldia," "Torreya," and others. In our own case we are fortunate in being able to derive a short, euphonious, one-word title from the name of the individual whose broad vision and interest lead him to provide funds, devised to the trustees of his estate, that lead to the establishment of the institution that bears his name. It is believed that the new name "Arnoldia" with its explanatory subtitle, "A Continuation of the Bulletin of Popular Information of the Arnold Arboretum, Harvard University," will be far more satisfactory than the somewhat cumbersome one that it replaces. It will, at the same time, reflect proper institutional credit on its sponsoring institution, the Arnold Arboretum, and on its holding body, Harvard University, as long as we are able to maintain it as a medium of publication that serves the needs of its supporters.

E. D. MERRILL

¹Merrill, E.D. One-name periodicals. *Brittonia* 1: 1-5. 1931.

²Raup, H.M. The genesis of the Arnold Arboretum. *Arnold Arb. Harvard Univ. Bull. Pop. Inf.* IV. 8: 1-11. pl. 1. 1940.

THE WHITE FLOWERING RHODORA

The rhodora is a typical New England shrub, growing from Labrador and Newfoundland, south to Pennsylvania. The correct scientific name is *Rhododendron canadense*, though it is known throughout New England by its synonym, *Rhodora canadensis*. It is one of our hardiest woody plants, being hardy in areas where the temperatures may go from 35 to 50 degrees below zero during the winter months. It is known and readily recognized for its delicate rose-purple flowers, appearing in the early spring before the leaves. It is usually found growing in slightly marshy ground. In ornamental plantings, it is valued for its early spring flowers and is used especially in naturalistic plantings.

A good place to see it is to go to Ralph Waldo Emerson's grave in Concord on May 25, his birthday anniversary. Because of his poem "Rhodora" and his affection for the flower, some admirer will have carried out the tradition. Whether the flowers come from the neighborhood or from far afield, there will be a bunch laid reverently upon the grave.

The white flowering variety of the rhodora, known as *Rhododendron canadense albiflorum*, is not a particularly "new" plant, but try to find it in any of last year's nursery catalogues! Not a single American nursery listed it last year or any year prior to that, as far as I know. However, it has been known to exist since 1894, at least, when it was described by Rand and Redfern in their "Flora of Mount Desert Island." The white flowering variety of *Rhododendron canadense* has all the characteristics of the species except that its flowers are white.

Fortunately for present-day gardens, Mr. Richard W. Hale of Boston became very much interested in this plant. In fact, he admired its qualities so much that he took it upon himself to locate individual plants or groups of plants with white flowers, in order that this variety could be propagated and become readily available to the average gardener. Mr. Hale has located *Rhododendron canadense albiflorum* growing at about nine different places. He advertised in various local papers in Maine and in "Horticulture" in order to find sources for good shrubs with pure white flowers. All plants which he has located are definitely white flowered.

Even though this plant had been growing in several places, no one had taken an active interest in propagating it and placing it on the market until Mr. Hale began to collect plants from the wild and to propagate them.

The only successful propagation so far has been by root division, which is altogether too slow. In this work Mr. Hale has had material assistance from Mr. Will C. Curtis of "Garden in the Woods," Sudbury.

However, even though Mr. Hale has over fifty plants now and can obtain more by collecting them from certain places in Maine, his supply would not go very far if there proved to be a large demand for this interesting native.

He has seen this from the first. The problem of a commercial supply for the introduction of this beautiful shrub is one of commercial propagation, and this rhodora is apparently going to be recalcitrant. The Boyce-Thompson Institute very kindly volunteered an attempt and candidly reported a failure. There may be some doubt whether the material supplied to them was adequate. Then Mr. Hale and Mr. Curtis went to East Boxford and laid the problem before Mr. Harlan P. Kelsey, Sr., who enthusiastically took on the task. Without waiting for plants of the white rhodora, he began experimental propagating of the purple form and looks forward to mastering the problem. We hope that in an early number of *Arnoldia* we shall be able to make a supplementary announcement, perhaps even stating that there will be some plants commercially available in the spring of 1942.

And so horticulture has one man to thank for his painstaking efforts in making this plant available to the gardening public. Mr. Hale, in locating sources for the white rhodora, in obtaining plants and growing them under his personal supervision to make certain the flowers were white, and finally in turning over his stock to a commercial propagator so that the plants will eventually become generally available, has done an exemplary piece of work. As a result, it is hoped that one more worthy shrub will soon become a common resident in gardens, not necessarily as a plant to be used in place of the purple flowered *R. canadense* but as one which can be used in combination with the latter, to supply an interesting color combination in early spring.

DONALD WYMAN

ARNOLDIA



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1941 SOURCES FOR RARE WOODY PLANTS

EVERY year the Arnold Arboretum is besieged with requests to locate certain rare woody plants which are very difficult to find in nursery catalogues. The institution makes a sincere effort to locate sources for such plants since one of its functions is to aid in the establishing of rare woody plants in this country, both in the commercial nurseries and in privately owned gardens. When a tree or shrub is eventually grown and offered for sale by one or more nurserymen in this country, the Arboretum, theoretically, does not feel the need of extensively propagating this particular plant in its own greenhouses, but rather refers all queries for it to the nurseryman who has propagated it and offers it for sale.

Many readers of this bulletin are desirous of having certain rare plants growing in their gardens but do not know where they may obtain them. As a service to these readers, we have gone to considerable trouble this season to locate rare woody plants actually now offered for sale in nursery catalogues issued for the **current year 1941**. Over two hundred current catalogues were requested by the Arboretum from all parts of the United States, and more than one hundred had actually been received at the time this bulletin was prepared. These catalogues have been checked carefully and a list of rare plants now in American commerce has been compiled, together with the names of the nurseries offering such plants for sale.

It is desirable to indicate that there may be several weaknesses in any such list. In the first place, some plants listed might not be considered "rare" by all individuals. Secondly, even though only one or two sources for a single plant are listed, it does not mean, necessarily, that these are the only places in the United States where such a plant can be obtained. It would be impossible to locate actually every source

for every plant. In most cases, we have been content to locate one or two sources only, because we feel that present-day transportation facilities enable the buyer to obtain live plants in good condition from any part of the country. Admittedly, the transportation expense from a distant nursery may be great, but it must be remembered that these plants are rare and we feel fortunate that we are able to give even one source, no matter how distant. Another weakness lies in the discrepancies in nomenclature, for which we are not responsible. An interesting example of this is shown in the case of the double-flowered form of *Cornus florida*. In the 1941 catalogues, a number of nurseries are listing this unusual plant, using the varietal names *alba-plena*, *multi-bracteata* and *plena*. The correct varietal name is *pluribracteata*, and it is so listed in this bulletin, even though the nurseries have it in their catalogues under the other names. Finally, we have no way of knowing if the plants offered are always true to name.

A word should be said about the method of checking the catalogues. They were examined in the order in which they arrived. Because we noted only the first few sources which we discovered for a plant, many nurseries that may carry the same forms will not be given credit for having certain of these plants. No preference was shown to any particular firm, or to any particular part of the country except that little attention was paid to plants for the far South. Several worthy nurseries—growers of rare plants—are not listed here merely because we did not receive their 1941 catalogues before this bulletin went to press.

All plants recorded in our 1941 files are not listed in this bulletin. For instance, one nursery, alone offers 250 species and varieties of *Fuschia*. We have located approximately 150 named varieties of lilacs, which could not be herein listed. One nursery last year listed about 100 species and botanical varieties of roses, but we have not as yet received its 1941 catalogue.

It is believed that this list of rare woody plants and their 1941 sources will be exceptionally valuable to the plant-buying public even though it may be out-dated by next fall or the following spring. We wish to call attention to the list of nurserymen offering rare woody plants in their 1941 catalogues, and we take this opportunity to compliment them for taking the time and trouble to grow rare things even when the demand for them must be rather limited.

If *Arnoldia* readers are interested in this list and would like to receive another list with plants not herein mentioned (possibly including the names of nurseries whose catalogues have not yet been received), please write to the Arnold Arboretum, Jamaica Plain, Massachusetts, and make your wishes known.

DONALD WYMAN

Nurseries Listing Rare Woody Plants in 1941 Catalogues

(Several other catalogues not yet received at the time this was prepared might also be included)

1. Adams Nursery, Inc., Springfield, Mass.
2. Andorra Nurseries, Inc., Chestnut Hill, Philadelphia, Pa.
3. Arapahoe Acres Nursery, Littleton, Colo.
4. Armstrong Nurseries, Ontario, Cal.
5. California Nursery Co., Niles, Cal.
6. Chase Nursery Co., Chase, Ala.
7. W.B. Clarke & Co., San Jose, Cal.
8. Carl S. English, Jr., 8546 - 30th Ave., N.W., Seattle, Wash.
9. Fruitland Nurseries, Augusta, Ga.
10. James I. George & Son, Fairport, N.Y.
11. Griffing Nurseries, Beaumont, Texas
12. Carl A. Hansen Nursery, Brookings, S.D.
13. D. Hill Nursery Co., Dundee, Ill.
14. I. E. Ilgenfritz Sons Co., Monroe, Mich.
15. Kallay Bros. Co., Painesville, Ohio
16. Kingsville Nurseries Inc., Kingsville, Md.
17. Kiyono Nurseries, Crichton, Ala.
18. Henry Kohankie & Son, Painesville, Ohio
19. Le-Mac Nurseries, Hampton, Va.
20. Manitoba Hardy Plant Nursery, Dropmore, Manitoba, Canada
21. McConnell Nursery Co., Port Burwell, Ontario, Canada
- 21A. J. Franklin Meehan & Sons, Inc., Mt. Airy, Phila., Pa.
22. Thomas B. Meehan Co., Dresher, Pa.
23. Naperville Nurseries Inc., Naperville, Ill.
24. Portland Wholesale Nursery Co., 306 S. E. Twelfth Ave., Portland, Oregon
- 24A. Rare Plants Nursery, Linwood, N.Y.
25. Sherwood Nursey Co., 141 S. E. 65th Ave., Portland, Oregon
26. The Siebenthaler Co., Catalpa Drive, Dayton, Ohio
27. Stark Bros. Nurseries, Louisiana, Mo.
28. Tingle Nursery Co., Pittsville, Md.
29. Towson Nurseries, Inc., Towson, Md.
30. Upper Bank Nurseries, Media, Pa.
31. Upton Gardens, Colorado Springs, Colo.
32. Wayside Gardens, Mentor, Ohio
33. Westminster Nurseries, Westminster, Md.
34. Willis Nursery Co., Ottawa, Kansas
35. Wohler's Nurseries, Narberth, Pa.

Rare Woody Plants listed in 1941 Nursery Catalogues

- Abies alba** (*A. pectinata*) 18
 pyramidalis 18
 cephalonica 7
 chensiensis 29
 concolor violacea 18
 firma 28, 18
 pinsapo glauca 7
- Acer buergerianum** 18
 cappadocicum (*A. laetum*) 18
 circinatum 28
 glabrum 3
 griseum 18
 mandshuricum 18, 26
 nikoense 18
- Actinidia chinensis** 4
- Aesculus**
 hippocastanum baumani 18
 octandra 18
 turbinata 18
- Albizzia julibrissin rosea** 18, 28
- Alnus glutinosa laciniata** 18
 tenuifolia 3
- Amorpha nana** 3
- Ampelopsis aconitifolia** 10
- Aronia arbutifolia** "Brilliantissima" 22, 15
 prunifolia (*A. atropurpurea*) 15
- Atraphaxis buxifolia** 20
- Berberis atrocarpa** 9, 17
 candidula 19
 chenaulti 33, 19
 corallina compacta 7
 darwinii 25, 5, 4
 dulcis nana 25, 24
 knighti 25, 5
 koreana 23, 22, 18, 15, 26, 1, 3
 pruinosa 9
 wilsonae 5
- Betula fontinalis** 18, 31, 3
 pendula fastigiata (*B. alba fastigiata*) 18, 22
 Buddleia alternifolia 5, 14, 15, 30, 34
 crispa (*B. paniculata*) 18
 lindleyana 18
- Horticultural Varieties**
 "Charming" 22, 32, 34
 "Concord" 15, 28
 "Dubonnet" 15, 32, 34
 "Eleanor" 15
 "Farquari" 15, 22
 "Fortune" 32
 "Ile de France" 15, 22, 34
 "Magnifica" 34
 "Orchard Beauty" 28
- Buxus microphylla koreana** 18, 26
- Buxus microphylla japonica** 24A
- Callicarpa americana lactea** (*C. americana alba*) 9
 dichotoma (*C. purpurea*) 1
 japonica 18
- Campsis grandiflora** (*C. chinensis*) 7
- Caragana arborescens lorbergii** 20
 boisi 18
 decorticans 26
 frutex 18
 grandiflora 20
 pygmaea 20, 3
 spinosa 20
- Carpinus betulus** 26, 22, 30, 18
 japonica 18
 tschonoskii (*C. yedoensis*) 18
- Cedrela sinensis** 18
- Cedrus libani compacta** 7
- Celastrus gemmata** 18
 loeseneri 32
- Celtis laevigata** (*C. mississippiensis*) 21A
- Cercis canadensis alba** 9, 16, 18
 siliquastrum alba 28
- × "**Chaenomeles californica**" 7
 "Enchantress" 32
 "Masterpiece" 32
 "Mount Everest" 32
 "Pink Beauty" 32

Chaenomeles (cont.)

- “Rosemary” 32
- “Sunset Glow” 32
- japonica 7
- japonica alpina 7
- japonica alpina “Naranja” 7
- “Incendie” 7
- lagenaria “Appleblossom” 7
- “Atrococcinea” 7
- “Blood Red” 7
- “Bonfire” 7
- “Candida” 7
- “Cardinalis” 7
- cathayensis (*C. cathayensis*) 32
- “Columbia” 7
- “Double Vermilion” 7
- “Foliis rubris” 7
- “Grandiflora” 7
- “Japanese Scarlet” 7
- “Kermesina semiplena” 7, 18
- “Knap Hill Scarlet” 7
- macrocarpa 7
- “Marmorata” 7
- nivalis 7
- pygmaea 18, 15
- “Rosea grandiflora” 18
- “rubra grandiflora” 7
- semperflorens 7
- “Vermilion” 18
- versicolor 7
- “versicolor lutescens” 7
- ×superba “Atrosanguinea” 7
- “Corallina” 7
- “Crimson and Gold” 7
- “Early Appleblossom” 7
- “Juliet” 7
- perfecta 7
- “Stanford Red” 7

Clematis brevicaudata 20

- crispa 18
- fargesii 18
- ×jackmani rubra 10
- ×jouiniana “Spingarn” 10
- ×lawsoniana 10
- ligusticifolia 18, 20
- montana undulata 10, 18
- rubens 10

wilsoni 18

serratifolia 18, 20

tangutica 18, 20

obtusiuscula 10

texensis 10, 18

×troutbeckiana 10

veitchii 18

viorna 18

vitalba 18

viticella 18

Horticultural Varieties

“Ascotiensis” 10

“Elsa Spath” 10

“Empress of India” 10

“Gipsy Queen” 10

“Grace” 20

“Huldine” 10

“Kermesina” 10

“King Edward VII” 10

“King of the Belgians” 10

“La France” 10

“Lady Betty Balfour” 10

“Lady Caroline Neville” 10

“Lady Northcliffe” 10

“Mr. G. J. Patijn” 10

“Mrs. Robert Bryden” 32

“Prins Hendrik” 10

“Ramona” 10

“The President” 10

“Ville de Lyon” 10

“Ville de Paris” 10

“W. E. Gladstone” 10

“William Kennett” 10

Clerodendron trichotomum 18, 19**Clethra** alnifolia rosea 28

barbinervis 18

Cornus controversa 28

florida pendula 2, 22, 29, 16

pluribracteata (*C. florida*
multibracteata, *C. florida*
plena, *C. florida alba-plena*)
 2, 7, 22, 16, 35, 26, 18, 6, 32,
 29

welchi 26, 28, 16, 18

nuttalli 24, 5

stolonifera coloradensis 3

Corylus avellana 33, 15

avellana aurea 18

- Corylus avellana** (cont.)
 fusco-rubra (*C. avellana purpurea*) 26
 heterophylla sutchuenensis 18
- Cotoneaster adpressa praecox** 16
 francheti 2, 11
 glaucophylla 7
 harroviana 28
 henryana 7
 integerrima 18
 lactea 19
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 nana 25
 tenuipes 18
- Crataegus arnoldiana** 18, 26
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 coloradensis 3
 colorata 7
 erythropoda 20
 flava 2
 hupehensis 18
 jacki 7
 × lavalleyi (*C. carrierei*) 18
 macrantha 18, 7
 nitida 18, 23
 persistens 18
 pinnatifida 20
 major 18
 sanguinea 20
 succulenta 23, 20
- Cryptomeria japonica nana** 25
- Cytisus albus** 24
 ardoini 7
 battandieri 7
 burkwoodi 4, 7
 hirsutus 18
 kewensis 7
 nigricans 18
 praecox 4, 25, 5, 24
 purpureus 25
 elongatus (*C. purpureus pendulus*) 7
 racemosus 5
 scoparius andreasus 18, 24
 "Borsch's Prostrate Broom" 25
 "California" 25
 "Dorothy Walpole" 25
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 "Pomona" 25, 4, 7
 "San Francisco" 25, 4
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 "Scandinavia" 32
 "Stanford" 25
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- Daphne cneorum variegata** 28
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- Davidia involuerata** 18, 2
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 × rosea 18, 15
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 carminea 18
 eximia 18
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- Diospyros kaki** 21A
- Elsholtzia stauntoni** 18, 15
- Enkianthus campanulatus pali-**
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- Erica ciliaris** 16
 × darleyensis 18
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- Eucommia ulmoides** 18
- Euonymus europaea alba** (*E. europaeus fructo-alba*) 32
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- Forsythia** ovata 32, 18, 15, 28, 3
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- Fothergilla** gardeni 18
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- Franklinia** alataamaha (*Gordonia alataamaha*) 18, 35, 2
- Fraxinus** excelsior pendula 21
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- spinosa alberti 18,20
- tatarica lutea 33,18
- sibirica 18,15,33

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- brachyanthum 8
- bracteatum 8
- calostrotum 8
- campylocarpum 8
- campylogynum 8
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- chasmanthoides 8
- ciliatum 8
- concinnum 8
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- cuneatum 8
- cyanocarpum 8
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- detonsum 8
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- didynum 8
- diphrocalyx 8
- discolor 8
- edgarianum 8
- euchaites 8
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- fauriei 8
- ferrugineum 8
- fulvum 8
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- griersonianum 8
- griffithianum 8
- haemaleum 8
- hanceanum 8
- heliolepis 8
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- hirsutum 8
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- trichocladum 8
- triflorum 8
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Subscription renewals for 1941 are now due. Those who have not resubscribed, and who desire to continue to receive *Arnoldia*, should remit \$1.00 to *Arnoldia*, Arnold Arboretum, Jamaica Plain, Massachusetts, at an early date to insure continuity in the receipt of the numbers as issued.

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 1

APRIL 4, 1941

NUMBER 4

1941 SOURCES FOR RARE WOODY PLANTS.
SUPPLEMENTARY LIST

MANY requests have been received for the last number of *Arnoldia* (Vol. 1, No. 2-3) and so many requests have come for more information of a similar nature that this bulletin is offered as a supplement. No more plant sources will be listed in *Arnoldia* this spring, but there are hundreds of names of other rare plants listed in the files of the Arboretum as being available from American nurseries in 1941.

It is truly surprising to note the number of different plants belonging to a particular genus which can be obtained after an examination of a series of catalogues. Particular mention should be made of the 223 lilacs and the 72 species and botanical varieties of roses. Not all are "rare" but because of wide special interest in these groups all available varieties in these two have been listed. The 25 available varieties of *Hibiscus syriacus* are also noteworthy.

It is suggested that in order to use this supplementary list properly, the information printed on pages 5 and 6 of the last bulletin be read carefully. The data there given applies equally well to the supplementary list, as well as to the nursery numbers appearing on page 7. After checking through the last bulletin, one nurseryman wrote a congratulatory letter, but expressed surprise at the absence of the names of certain nationally known nurseries which have advertised rare plants for years. He continued to note with satisfaction, that although the name of his own nursery was not given, yet in his 1941 catalogue he had listed over 100 of the species and varieties mentioned in that bulletin! We are glad to mention his nursery, among others, in our supplementary list as we have just received his catalogue.

However, it should be clearly understood that we have merely examined catalogues in the sequence in which they arrived; that we considered two or three sources sufficient for one species or variety; and that simply because a certain nursery is not listed does not mean it has no rare plants. Sometimes nurseries are tardy in sending their catalogues. As this number of "Arnoldia" goes to press April 1, certain catalogues that we would have liked to examine have not been received.

Like the previous list, this supplementary one doubtless has its defects, but if it helps the gardening public to obtain rare plants and so learn to appreciate them, then it will have served its purpose.

DONALD WYMAN

Additional Nurseries listing Rare Plants in 1941

36. Bay State Nurseries, North Abington, Mass.
37. Bobbink and Atkins Nurseries, East Rutherford, N.J.
38. Brand Peony Farms Inc., Box 408, Faribault, Minn.
39. Cherry Hill Nurseries, West Newbury, Mass.
40. Cole Nursery Co., Painesville, Ohio
41. F. & F. Nurseries, Springfield, N.J.
42. Farr Nursery Company, Weiser Park, Penna.
43. Joseph B. Gable, Stewartstown, Penna.
44. Gardens of the Blue Ridge, Ashford, McDowell Co., N.C.
45. Outpost Nurseries, Ridgefield, Conn.
46. Princeton Nurseries, Princeton, N.J.
47. Rockmont Nursery, P.O. Box 266, Boulder, Colo.
48. Upton Nursery Co., 4838 Spokane Ave., Detroit, Mich.
49. Weston Nurseries, Weston, Mass.
50. Wyman's Framingham Nurseries, Framingham, Mass.

Supplementary List

Rare Woody Plants listed in 1941 Nursery Catalogues

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| conica 26 | ambigua 18 |
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| handsworthi 18,29 | conspicua decora 7,4,19 |
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- "Dr. H. C. Dresselhuys" 37,39,41
- "E. S. Rand" 41,37,16
- "Everestianum" 37,41,39
- "F. D. Godman" 37,39,2
- "General Grant" 2
- "H. H. Hunnewell" 41
- "Ignatius Sargent" 37,41,39
- "Kettledrum" 16,2
- "Lady Armstrong" 2,41
- "Lady Grey Egerton" 37
- "Lee's Dark Purple" 37,39,28
- "Luciferum" 2
- "Mrs. C. S. Sargent" 41,39,37
- "Mrs. Harry Ingersoll" 2
- "Mrs. P. den Ouden" 39

Rhododendron Hort. Vars. cont.

- "Old Port" 2,37,41
- "Parson's Gloriosum" 2
- "Parson's grandiflorum" 2
- "Parson's rubrum" 41
- "President Lincoln" 28
- "Purpureum elegans" 37, 41,2
- "Purpureum grandiflorum" 37
- "Roseum elegans" 37,39, 41
- "Roseum superbum" 2,41
- "Sefton" 2
- "Stella" 2

Azalea Hort. Vars.

Note—These include only the Ghent, Mollis and Kaempferi hybrids and not the many Kurume and Indian Azaleas.

- "Atlanta" 19,28
- "Beaute Celeste" 29
- "Betty" 28
- "Big Joe" 43
- "Bouquet de Flore" 2,29
- "Carmen" 19,28
- "Caroline Gable" 43
- "Cherokee" 43
- "Chinook" 43
- "Cleopatra" 19
- "Coccinea speciosa" 2,29
- "Daviesi" 2
- "Elizabeth Gable" 43
- "Emite" 29
- "Fedora" 40,19
- "Gloria Mundi" 2
- "Glow of Dawn" 43
- "Herbert" 43
- "Ignea Nova" 29
- "Iroquois" 43
- "La Lumiere" 43
- "La Premiere" 43
- "Louise" 40
- "Louise Gable" 43
- "Mary" 29
- "Mary Dalton" 43
- "Mauve Queen" 19
- "Mildred Mae" 43
- "Miriam" 43

- "Nancy Waterer" 2,29
- "Narcissiflora" 29
- "Old Faithful" 43
- "Othello" 19,40
- "Pallas" 2
- "Polaris" 43
- "Purple King" 19,29
- "Rembrandt" 29
- "Sang de Gentbrugge" 2, 29
- "Souv. de Pres. Carnot" 2
- "Springtime" 43
- "Unique" 2
- "Viola" 43
- "William III" 29
- "Willy" 29
- "Zampa" 19

**Rosa acicularis 3,37,26
nipponensis 37**

- × alba 37
- alberti 37
- arvensis 37
- bella 37
- blanda 37,40
- canina 26,18,37
- carolina 37,26,40
- centifolia 37
- muscosa 37
- chinensis minima 37,41,18
- mutabilis 37
- viridiflora 37
- cinnamomea 37,40
- coriifolia froebeli 18.
- damascena 37
- trigintipetala 37
- versicolor 37
- davurica 18
- ecae 18
- eglanteria 37,46,18
- foetida bicolor 37
- persiana 18,39
- glutinosa 37
- × harisoni 39
- helenae 37
- hugonis 37,40
- laevigata 37
- × Lheritierana 37
- luciae fujisanensis 18
- marreti 18

Rosa (cont.)

- maximowicziana jacki 37
- × micrugosa 37
- moyesi 18, 37
- multiflora 37
 - cathayensis 18, 37
- nitida 37, 41, 26
- odorata gigantea 37
- omeiensis 37
- palustris 37
- pendulina 18
- primula 37
- richardi 37
- × reversa 37
- roxburghi 37
 - hirtula 37
 - plena 37
- rubrifolia 26, 37, 41
- rugosa 37
 - alba 37
 - albo-plena 37
 - “repens alba” 37
 - rubro-plena 37
- sempervirens 37
- sericea 18
- setigera 37
- soulieana 37
- spinosissima 37
 - “alba plena” 37
 - altaica 18, 37
 - fulgens 37
 - hispida 18, 37
 - vorbegi 37
- virginiana 37
 - alba 37
- watsoniana 37
- wichuraiana 37
- willmottiae 37
- woodsi 31, 37
 - fendleri 37
- xanthina 37
- Syringa** amurensis 48
 - japonica 48, 37, 49
- × chinensis 49, 50
 - alba 48
 - saugeana 42, 49
- emodi 48, 7
- × henryi “Floreal” 48
 - “Lutece” 37, 48, 38

- × hyacinthiflora 49
 - “Berryer” 37
 - “Buffon” 7, 37, 48
 - “Claude Bernard” 28, 37
 - “Descartes” 16
 - “Lamartine” 23, 48
 - “Louvois” 7
 - “Mirabeau” 23
 - “Montesquieu” 48
 - “Pascal” 23, 26
 - “Vauban” 28, 37, 48
 - “Villars” 23
- josikae 42, 48, 49
- julianae 37, 48
- komarowi 16, 48
 - sargentiana 48
- meyeri 16, 48
- microphylla 37, 48
- oblata 48
 - affinis 48
 - dilatata 37, 48
 - giraldi 16, 48
- palibiniana 16
- pekinensis 16, 48
- persica 48, 49, 36
 - alba 42
 - laciniata 16, 48
 - rubra 42
- pinetorum 16, 48
- pinnatifolia 16, 48
- potanini 48, 49
- pubescens 48, 49, 16
- reflexa 48, 38, 16
- sweginzowi 16, 37, 48
 - superba 7, 48
- tomentella 16, 48
- velutina 48
- villosa 48, 49
- vulgaris 50, 36, 38
 - alba 48, 49, 36
- wolfi 48, 16
- yunnanensis 48
- Syringa vulgaris Hort. Vars.**
 - “Adelaide Dunbar” 37, 48
 - “Alexander Hamilton” 7
 - “Alice” 38
 - “Aline Mocqueris” 16, 49
 - “Alphonse Lavallee” 37, 48

S. vulgaris Hort. Vars. (cont.)

"Amy Schott" 7
 "Arthur William Paul" 37
 "Belle de Nancy" 37,48,
 50
 "Bleuatre" 37,42,48
 "Boussingault" 16,37
 "Capitaine Baltet" 42,49
 "Capitaine Perrault" 37,
 48
 "Carmen" 42
 "Catinat" 37
 "Cavour" 49
 "Charles X" 37,48
 "Charles Baltet" 37
 "Charles Hepburn" 37
 "Charles Joly" 42,48,36
 "Charles Sargent" 42,48
 "Christophe Colomb" 37,
 42
 "Clara" 28
 "Clara Cochet" 49
 "Colbert" 37,48
 "Comte Adrien de Monte-
 bello" 38,42
 "Comte de Kerchove" 37
 "Condorcet" 37,48,50
 "Congo" 37,42,48
 "Dame Blanche" 49
 "De Miribel" 7,42
 "De Saussure" 42
 "Decaisne" 42,48
 "Diderot" 38,42
 "Diplomate" 7
 "Dr. Humboldt" 37
 "Dr. Maillot" 37,49
 "Dr. Masters" 37
 "Duc de Massa" 49
 "Eden" 7
 "Edith Cavell" 37,42,48
 "Edmond About" 37,38
 "Edmond Boissier" 37,42
 "Ellen Willmott" 42,48
 "Emile Gentil" 42,49
 "Emile Lemoine" 16
 "Etna" 37,48
 "Furst Liechtenstein" 37
 "Geheimrat Singelmann"
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"General Grant" 48
 "General Pershing" 16,48
 "General Sherman" 37,48
 "Georges Bellair" 37,42
 "Glorie de Lorraine" 48
 "Gloire de Moulins" 48
 "Glory de Horstenstein"
 37
 "Godron" 37,38
 "Goliath" 42
 "Grace Orthwaite" 38
 "Grand-Duc Constantin"
 37
 "Henri Martin" 37,38,49
 "Henry Ward Beecher" 23
 "Herman Eilers" 37
 "Hippolyte Maringer"
 38,42
 "Hugo Koster" 37,49,36
 "Hugo de Vries" 37,7
 "Jacques Callot" 38,42
 "Jan Van Tol" 37,42,48
 "Jean Mace" 37,42
 "Jeanne d'Arc" 48
 "Jules Ferry" 37,42
 "Jules Simon" 37,42
 "Justi" 23
 "Kate Harlin" 37
 "Katherine Havemeyer"
 37,48
 "La Tour d'Auvergne" 23
 "Lamarek" 28
 "Laplace" 7
 "Lavoisier" 49
 "Le Notre" 37
 "Le Printemps" 23
 "Leon Gambetta" 16,38
 "Leon Simon" 37,42
 "Leopold II" 16,37
 "Lilarosa" 23
 "Linne" 28
 "L'Oncle Tom" 48
 "Lucetta" 38
 "Lucie Baltet" 37,42,48
 "Ludwig Spaeth" 37,48
 "Macrostachya" 38
 "Marc Micheli" 28,42
 "Marceau" 16,23
 "Marechal de Bassom-

S. vulgaris Hort. Vars. (cont.)

pierre" 37
 "Marechal Foch" 37,48
 "Marechal Lannes" 42,48
 "Marengo" 37,48
 "Marie Finon" 28,7
 "Marie Légraye" 37,48,36
 "Massena 42,48
 "Maurice Barres" 28,7
 "Maurice de Vilmorin"
 37,38
 "Maxime Cornu" 37
 "Maximowicz" 7
 "Michel Buchner" 37,48,
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 "Milton" 16,38
 "Mireille" 7
 "Mlle. Fernande Viger"
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 "Mme. Abel Chatenay"
 37,49
 "Mme. Antoine Buchner"
 37,48
 "Mme. Briot" 37,28
 "Mme. Casimir Perier"
 37,32,48
 "Mme. F. Morel" 37,48
 "Mme. Felix" 28,37
 "Mme. Florent Stepman"
 16,49,50
 "Mme. Kreuter" 48,49
 "Mme. Lemoine" 37,48
 "Mme. Leon Simon" 38
 "Monge" 38,48
 "Mont Blanc" 42,49
 "Montaigne" 37,49
 "Monument Carnot" 48
 "Mrs. Edward Harding"
 37,48
 "Mrs. McKelvey" 23
 "Mrs. W.E. Marshall" 49
 "M.J. de Messemæker"
 37,38
 "M. van Aerschot" 37
 "Naudin" 37
 "Negro" 37,48
 "Olivier de Serres" 48,49
 "Othello" 16
 "Pascal" 36

"Pasteur" 49
 "Paul Deschanel" 28,48
 "Paul Hariot" 37,16
 "Paul Thirion" 38,48
 "Pearl" 7
 "Philemon" 49
 "Planchon" 49
 "President Fallieres" 38
 "President Grevy" 37,48
 "President Lincoln" 42
 "President Loubet" 38,48
 "President Poincare" 38,
 42
 "President Viger" 38
 "Prince de Beau Veau" 37
 "Princess Alexandra" 49
 "Princess Clementine"
 37,49
 "Prodige" 7
 "Professor E. Stoekhardt"
 23,48
 "Professor Sargent" 49
 "Reaumur" 37,49
 "Rene Jarry-Desloges"
 37,48
 "Rochambeau" 38
 "Roi Albert" 16
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 "Rubra de Marly" 16,36
 "Ruhm von Horstenstein"
 28,38
 "Saturnale" 42
 "Seneateur Volland" 38
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 16,38
 "Sunol" 7
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 38,48
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 "Victor Lemoine" 26,38
 "Violetta" 37,38
 "Virginite" 37,16
 "Viviand-Morel" 48,42
 "Volcan" 23,49
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ARNOLDIA



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THE ONE-HUNDREDTH ANNIVERSARY OF THE BIRTH OF CHARLES SPRAGUE SARGENT

CHARLES Sprague Sargent, first Director of the Arnold Arboretum, had an insatiable interest in trees. Even before his association with the institution, he was interested in botany and in horticulture, his first appointment at Harvard University being as Director of the Botanic Garden in Cambridge. On assuming the directorship of the Arnold Arboretum in 1873, he already appreciated the tremendous value of collections of living plants as a means of promoting public interest in horticulture. His desire for study and for research, combined with his deep love of plants and a thorough appreciation of landscape design, eminently fitted him for the adoption of an unusually farsighted policy in reference to the development of the Arnold Arboretum; and the policies that he developed and maintained throughout his productive life insured the future of the institution and its present pre-eminent position. The Arnold Arboretum is the oldest institution of its kind in America, remarkable among its other accomplishments for the extraordinarily large number of species that it has introduced into cultivation both in America and in Europe.

To Charles Sprague Sargent horticulture and botany owe a great debt, a fact that is fully appreciated by those who knew him and his work during his fifty-three years of service as Director of the Arnold Arboretum. However, time frequently dims individual accomplishments, and so it seems fitting on this, the one-hundredth anniversary of his birth, briefly to review the conditions under which he commenced his pioneer work in the early days of the institution, together with some data appertaining to its present scope and resources; for what the institution is today is due to the long-continued, consistent, and highly intelligent guidance initiated by its first Director.

Charles Sprague Sargent was born April 24, 1841, he being the third child of Ignatius and Henrietta (Gray) Sargent. His father was a well known merchant of Boston and a direct descendant in the fourth generation of William Sargent, who probably came from England before 1678. Professor Sargent was graduated from Harvard University in

1862, and in the following year joined the United States Army, in which he served during the remainder of the Civil War, attaining the rank of brevet-major. After leaving the army he spent three years in European travel and on his return continued his interest in horticulture by managing his father's beautiful estate in Brookline. In 1872 he was appointed Director of the Harvard Botanic Garden, and served as professor of horticulture in 1872 and 1873. On November 24, 1873, he was appointed to direct the newly created Arnold Arboretum, and two days later married Mary Allen Robeson, a talented and charming woman, daughter of Andrew Robeson of Boston. Their life together covered nearly half a century, and it is difficult to disassociate the aims and activities of the one from the other. Briefly then, this is the story of Sargent's life up to the time that he became associated with the Arnold Arboretum. He was endowed with an excellent background, a splendid ancestry, and, fortunately for what he wished to accomplish, was financially independent. He was intimately associated with the prominent men and women of Boston, from many of whom he obtained liberal financial contributions for the development and support of the new institution which he had been selected to direct, and this long-continued support aided him materially in developing the institution that he loved so dearly. (For a more detailed account Rehder, Alfred; Charles Sprague Sargent, *Jour. Arnold Arb.* 8:69-86. 1927).

What he accomplished after 1873 was due largely to his increasing desire to make the Arnold Arboretum a garden of trees unsurpassed in America, and to this purpose he devoted all his energies, working early and late, day after day, month after month, year after year. The straightforward, impersonal account of the first fifty years of the Arnold Arboretum (*Jour. Arnold Arb.* 3: 127-171. 1922) is his own modest account of the greater part of his own productive life. It is familiar knowledge that in 1873 he took charge of approximately 125 acres of very poor land, and with an annual assured income of only about \$3,000 with which to establish and develop an institution (for further information see Raup, H.M. *The Genesis of the Arnold Arboretum. Bull. Pop. Inf. Series 4, Vol. 8: 1-11. 1940*). No one, least of all Sargent, realized what was ahead, yet he and his associates immediately commenced the development of the plantings, and in the first decade of his directorship, worked out the famous agreement between the City of Boston and Harvard University in such an ideal way that this arrangement is still a model for newly established arboreta. The acreage has been increased by gift and by purchase, until today the Arboretum covers approximately 265 acres.

Professor Sargent's greatest interest was in the living collections at the Arboretum. Everything that he did was planned to increase the number of plant species actually growing on the grounds and to disseminate knowledge appertaining to them. This is why he himself traveled extensively in Europe and in Japan; this is why he developed relationships with individuals in foreign countries, such as Bretschneider in Peking; this is why he employed E.H. Wilson; this is why he constantly fostered plant exploration in distant lands where climatic conditions were somewhat similar to those in Boston; and this is why

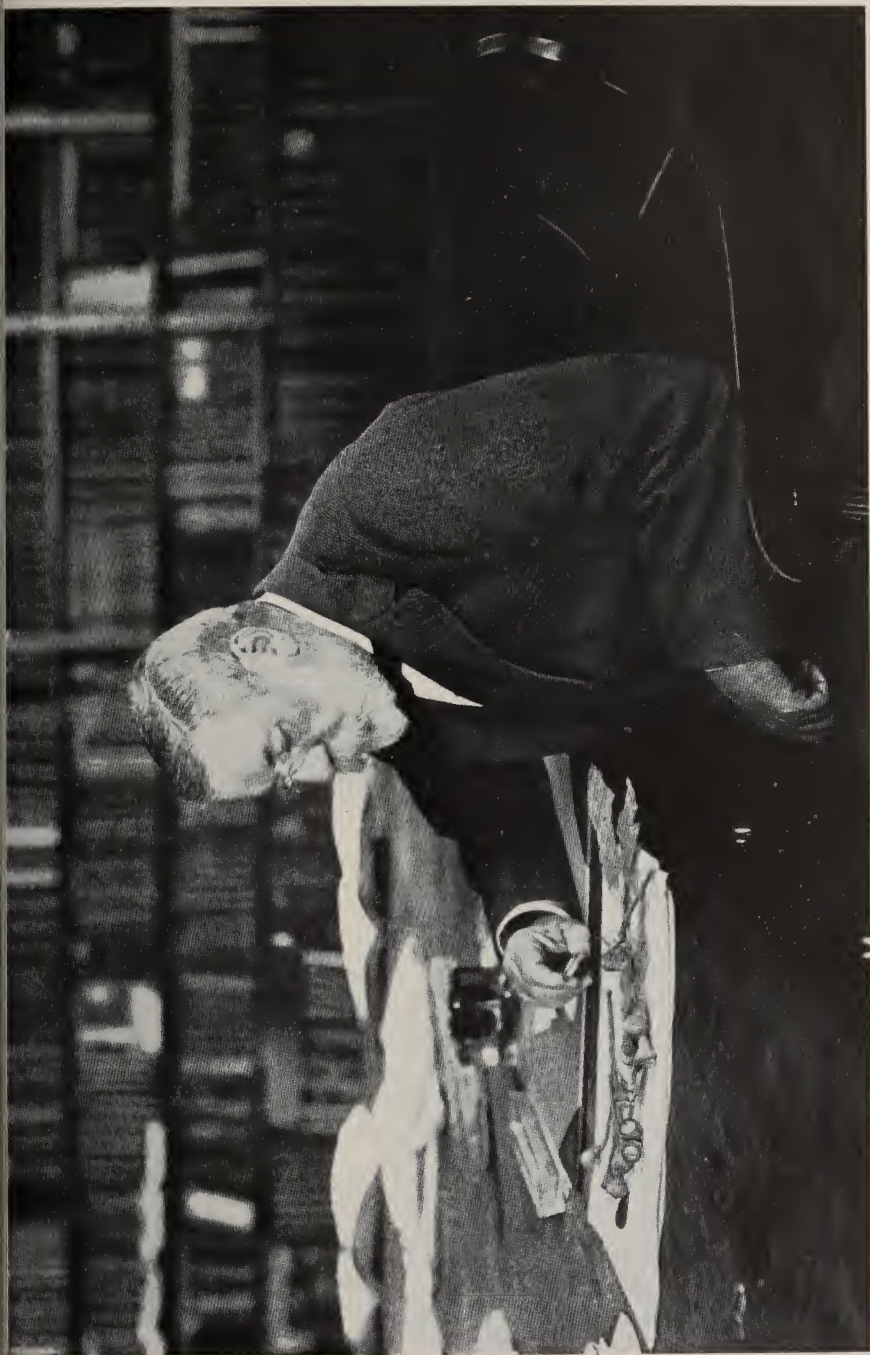


PLATE I

Professor Charles Sprague Sargent in the Arnold Arboretum Library—1904.

he bequeathed to the Arboretum the capital sum of \$10,000 under the condition that income be added to capital for one hundred years, at which time, one-half of the accumulated sum is to be made available for Arboretum maintenance and development and the remaining half is to be left to accumulate interest for a second hundred years, when this amount, also, may be used for Arboretum purposes. Truly an expression of faith in what had been his life work!

In 1873, Professor Sargent listed 118 different kinds of trees, shrubs, and vines, mostly native, that were already growing on the property when he was appointed Director of the Arboretum. In the first two years, he acquired 274 additional species, and constant annual accessions have been received since that time, until now, instead of the 118 species listed in 1873, there are about 6,500 different species and varieties actually in cultivation within the grounds. During a sixteen year period starting in 1922, 43,000 packages of seeds, 38,000 living plants, and 11,000 lots of cuttings were distributed by the institution. Last year alone, 552 packages of seeds taken from its own plants and 824 packages collected by its cooperative expeditions in China were sent out as well as 4,115 living plants, 946 lots of cuttings and scions, these going to various institutions and individuals.

In 1874, he acquired a few needed publications to guide him in intelligently planning and planting the Arboretum, and from time to time within the next few years secured other reference works. It became increasingly evident, however, that the young Arboretum needed every cent of its limited income for expenditure in acquiring and planting trees and shrubs and in propagating them for distribution. Consequently, Professor Sargent urged many of his friends to donate botanical and horticultural books to the Arboretum, and his reports covering the first decade of its existence show that several hundred volumes were thus received each year. In 1892, when the Administration Building was constructed with funds provided by Horatio Hunnewell, Sargent presented his personal library of some six thousand volumes to the Arboretum, a most important gift, as it contained many rare and highly prized volumes. Later he acquired and presented many more items, and the total was further increased by gifts from his friends. It was Professor Sargent who laid the foundation for the Arnold Arboretum library through his personal gifts, and who provided for its constant increase.

When Mrs. Sargent died in 1919, she bequeathed \$5,000 to the Arboretum, the capital amount in the Mary Robeson Sargent Fund now being \$7,845.75; the income from this fund may be used only for the purchase of books. On Professor Sargent's death in 1927, he bequeathed \$20,000 to the Arboretum, the income from which is also restricted to the purchase of books. Thus today, from these two funds, the Arboretum has an approximate annual income of \$1,150 for the purchase of books, this forming a living memorial to the man who established the library and nursed it from infancy. Today it contains approximately 44,500 bound volumes, 12,800 pamphlets, and 18,700 photographs, being one of the largest, most comprehensive, and most valuable botanical-horticultural libraries in the world.

Another essential part of the Arboretum is the herbarium, which

Professor Sargent himself started by collecting specimens on his earlier trips. Commencing in January, 1880, an assistant (without compensation) gave full time to the building up of the herbarium. At this time there were 848 mounted specimens and 1,073 unmounted ones available, either collected by Professor Sargent or received as gifts. In the following eight months, 1060 species, represented by 2,736 specimens, were added to the collection. Since there was no building within the grounds suitable for herbarium purposes, the collections were housed in a vacant building on the Sargent estate, loaned for the purpose by Ignatius Sargent.

Such were the meagre beginnings of the herbarium. Due to the continued interest of Professor Sargent and his successors, this collection of reference material has become world-famous in its own right. Today approximately 495,000 mounted specimens of woody plants are represented in the organized herbarium, with approximately 100,000 more mounted but not yet distributed, and an equally large number of unmounted specimens. This great reference collection contains material from practically every country in the world. The herbarium is staffed by a number of full-time productive workers. Last year, twenty-six loans, approximating 2,300 specimens were sent to individuals in thirteen other institutions for study purposes. In the same period, about 67,000 specimens were actually received. Due to its vigorous growth, the herbarium was moved from the Sargent estate to the Administration Building, as soon as the latter was completed, in 1892. A large herbarium annex was added in 1905, but the combined herbarium space of these two buildings is now far too small for these tremendously valuable and rapidly expanding collections.

Due to Professor Sargent's efforts, the Arboretum increased from an initial 125 acres of worn-out pasture land to an area of 265 acres, on which is maintained a world-famous collection of living plants, a library unequalled in its field in the world, and an herbarium of woody plants surpassed in extent and value by no similar restricted collection elsewhere. After Professor Sargent's death, his friends subscribed \$1,066,993.90 to form the Charles Sprague Sargent Memorial Fund, this being done in appreciation of his life-long work and his outstanding accomplishments in the general fields of horticulture and botany. The income from this fund made it possible to expand the functions of the Arboretum, particularly in the research field, a development which Professor Sargent had long desired.

Now the Arnold Arboretum is an integral part of Harvard University, several of its staff teaching regular University courses, and others directing graduate students. The grounds, library, and laboratories are used not only by staff members and Harvard University students, but by individuals and scientists from many parts of the world. Many individuals have contributed to make the Arnold Arboretum the institution that it is today, but the outstanding contributor of time, thought, effort, farsighted direction, and funds was Charles Sprague Sargent. Many honors were bestowed upon Professor Sargent during his long and productive career, but the Arboretum itself stands as a living memorial to him, for of him it may most truly be said: *Si monumentum requiris, circumspice.*

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RHODODENDRON INJURY

LAST winter was very trying to rhododendrons. Old plants and young plants were injured, and in some cases killed, from New Jersey to Maine, and it is most difficult to explain the exact causes. The injury has struck so suddenly and been so widespread that it is doubtful if it could be caused by disease. The only logical blame might be placed on the weather, though there are several loopholes in this explanation also. It is yet too early to state the exact causes definitely, and since it occurred over such a wide area there may well have been several contributing causes, but until careful examinations are made, it would seem logical to blame it on the weather.

The situation has been this. During the past winter the weather has been consistently cold and the snow on the ground remained as a good covering until March 22 in Boston, or two days later in the suburbs, according to the Boston Weather Bureau, with the temperature averaging six degrees below normal for the earlier part of March. As far as the plants were concerned, this was satisfactory, and not harmful.

However, suddenly on March 23rd the temperature rose to 56 degrees. There was a cloudless sky and 100% sunshine with a wind of seventeen miles per hour. The relative humidity fell to the low thirties though it had been considerably higher for a greater part of the month. A similar condition prevailed on March 26th and 27th, culminating on the 31st with a maximum temperature of 49 degrees, a wind of twenty-four miles per hour, and the remarkably low humidity of 17%.

Naturally, with such comparatively high temperatures and low humidities, the plants, especially the rhododendrons, would transpire

a great deal. However, the ground was still frozen, and after a long winter, such a high transpiration was serious to almost any broad-leaved evergreen since the soil water was still frozen and hence unavailable to the plants. In other words, rhododendrons, normally lose a certain amount of water all winter long, even though this supply cannot be replenished from the frozen ground. This is the reason for watering them in the fall thoroughly, before the soil freezes, so that they will have sufficient moisture to carry them through the winter. When, after several months with the ground frozen, a few days come with winds, high temperatures and low humidities, the rhododendrons are called upon to give off more water than they can afford to lose, and the result is total or partial death of certain plant parts. Added to this is the fact that since the ground has thawed there has been only one half inch of rain up until April 23rd, and the damage has been evident long before this. Hence, during the period when not only the roots of rhododendrons but their tops as well might have been benefited with extra water, there was only one half inch of rain in a month's time.

This explanation also may assist in explaining why some plants were injured and others close by were not, for the uninjured plants may have had a deeper root system and hence been able to tap a larger supply of water.

However, the damage has been done over a wide area. Not only rhododendrons, but mountain-laurel and other broad-leaved evergreens have been injured. Hemlocks and narrow-leaved evergreens have been injured to less extent, chiefly in exposed situations. As far as can be found out at this time, a few deciduous plants also have been injured.

Now that the injury is evident, what steps should be taken to help the rhododendrons back into good growth? In the first place, it may be too soon to prune heavily. Certainly watering the roots if the ground is dry, and sprinkling the tops in the late evening after the sun has set, might help the plants recover and prevent the injury from spreading. In fact, one recommendation has been made that partially injured plants be sprayed with some one of various rubber solutions now on the market to prevent excessive transpiration; but none too much is known yet concerning the final results of these rubber (or wax) solutions on rhododendron foliage and it might be a better policy to spray the foliage with water in the evenings. Later on, when the extent of the injury can be definitely determined, all injured wood should be removed. The danger from pruning too heavily at this time is because it is frequently difficult to distinguish injured wood from uninjured



PLATE II

Flowers and fruits of the hardy orange, *Poncirus trifoliata*. This bloomed well in the Arboretum last week and came through the winter uninjured, though hardier shrubs suffered considerably.

wood, and it would be a pity to remove live wood unnecessarily.

Little can be done to prevent such injury again. Mulches are always recommended for rhododendrons, yet in late winter and early spring when the damage from the above-mentioned causes is greatest, the mulch does prevent the ground from thawing out rapidly. Possibly protecting exposed plants with some screens against winds would prove helpful but this is usually practiced under normal conditions. It is doubtful if many of these severely injured rhododendrons will regain good health. Certainly those people owning collections must be prepared to take some loss of plants, and a smaller number of flowers this spring will undoubtedly be the result in most gardens.

Another Arnold Arboretum Field Class

A field class will be conducted at the Arnold Arboretum on Saturday mornings during the month of May. This class has proved popular in former years, and is open to all those who wish to gain a more intimate knowledge of the flowering trees and shrubs growing in the Arnold Arboretum. Dr. Donald Wyman, Horticulturist of the Arboretum, will conduct the class for a two-hour period each Saturday morning, weather permitting, during the month of May. The objective will be to study the various woody plants as they come into bloom, and to consider any additional points of culture and care which may be desired by those attending. No previous training is essential, but it would be helpful if applicants would register in advance by mail.

The first meeting will be on Saturday, May 3, from 10 to 12 A.M. There will be a nominal registration fee of \$1.00 per person, payable in advance by mail. The group will meet promptly at the Forest Hills Gate, the entrance to the Arboretum which is nearest the Forest Hills station of the Boston Elevated Railways. The group will study the various collections of flowering plants in the sequence in which they bloom, and the better horticultural varieties will be pointed out together with nursery sources where they may be obtained. Though many of the plants growing in the Arboretum are "rare", a thorough investigation of 1941 nursery catalogues has disclosed 1941 nursery sources for literally hundreds of woody plants formerly considered unobtainable in this country. Hence, by continually referring to the availability of the "rare" plants considered by the group, the information obtained will be decidedly practical and timely to New England garden owners. **All those interested should register immediately as it may be necessary to limit the number in the class.**

DONALD WYMAN

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

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NUMBER 7

WINTER INJURY AND SERIOUS PESTS TO BE FOUGHT NOW

IN the last issue of *Arnoldia*, (Vol. 1, No. 6, April 29, 1941), mention was made of the severe damage done to rhododendrons and a few other evergreens during the past winter, especially during the latter half of March of this year. Since that bulletin was written, considerable damage has appeared among deciduous plants, both trees and shrubs, including species which normally are not subject to winter injury. A careful examination of hundreds of plants affected at the Arnold Arboretum shows a very confusing picture. Shrubs in certain areas may be killed to the ground, whereas the same species in another part of the Arboretum in apparently just as exposed or just as protected situations, may be completely unharmed.

As a result of these confusing data, it seems advisable at this time to base the winter damage on the vagaries of the weather as explained in that bulletin. This does not explain why twenty-five and thirty-foot tall varieties of *Carpinus betulus* are injured for the first time in many years, nor does it explain why *Kerria japonica* is uninjured at one place and severely injured at another. Nor does it explain why the species of *Exochorda*, normally somewhat tender, escaped injury in all parts of the Arboretum, nor why *Abelia grandiflora* is badly injured while *Viburnum macrocephalum sterile*, growing next to it, is in perfect condition.

Believing that some readers of *Arnoldia* would be interested in a partial list of plants which have shown more or less severe winter injury up to the present time, such a list is given below. While some of these are subject to slight injuries every winter, these have been included as a matter of record. If the list does nothing else, it may help to console gardeners by recording the fact that winter injury has hurt gardens besides their own.

A Few of the Woody Plants Injured Last Year

| | |
|---|---|
| <i>Abelia grandiflora</i> | <i>Lonicera korolkovi</i> |
| <i>Amorpha fruticosa</i> | myrtillus |
| <i>Berberis vulgaris atropurpurea</i> | orientalis longifolia |
| <i>Buddleia alternifolia</i> | standishi lancifolia |
| <i>Callicarpa</i> sp. | tatarica angustifolia |
| <i>Calycanthus fertilis ferax</i> | latifolia |
| <i>Carpinus betulus carpinizza</i> | lutea |
| globosa | thibetica |
| horizontalis | <i>Philadelphus</i> —most sp. and vars. |
| quercifolia | <i>Physocarpus capitatus</i> |
| <i>Cornus florida</i> —50% of the | intermedius parvifolius |
| flower buds | <i>Prunus maritima</i> |
| rubra—branches killed | subhirtella |
| <i>Coronilla emerus</i> | pendula “A. J. Ives se- lection” |
| <i>Corylopsis pauciflora</i> | <i>Ptelea trifoliata mollis</i> |
| <i>Cotoneaster microphylla</i> | <i>Rhododendrons</i> —many hybrids and species |
| <i>Cydonia oblonga</i> | <i>Ribes gordonianum</i> |
| <i>Cytisus</i> “Burbank hybrids” | holosericeum |
| elongatus | nigrum apiifolium |
| sessilifolius | petraeum |
| scoparius | <i>Rosa rugosa</i> |
| andreanus | spinosissima “Plato” |
| <i>Deutzia hypoleuca</i> | “Pythagoras” |
| lemoinei | watsoniana |
| rosea | <i>Sophora viciifolia</i> |
| <i>Gordonia alatamaha</i> | <i>Spiraea</i> sp.—most of them in- jured |
| <i>Hydrangea arborescens</i> | <i>Staphylea colchica</i> |
| cinerea | pinnata |
| <i>Ilex crenata convexa</i> | <i>Stephanandra tanakae</i> |
| helleri | <i>Symphoricarpos chenaulti</i> |
| <i>Kalmia latifolia</i> | <i>Viburnum dentatum</i> |
| <i>Kerria japonica</i> | venosum canbyi |
| <i>Leucothoe racemosa</i> | <i>Weigela</i> “Congo”—others very little |
| <i>Ligustrum acuminatum macro- carpum</i> | |
| <i>Lonicera fragrantissima</i> | |
| involucrata serotina | |

A Few of the Woody Plants Killed to the Ground

| | |
|----------------------------------|----------------------------------|
| <i>Amorpha brachycarpa</i> | <i>Cytisus ratisbonensis</i> |
| canescens | <i>Genista pilosa</i> |
| <i>Calycanthus fertilis</i> | <i>Helwingia japonica</i> |
| floridus ovatus | <i>Ligustrum obtusifolium</i> |
| <i>Carpinus betulus compacta</i> | <i>Lonicera quinquelocularis</i> |
| <i>Ceanothus americanus</i> | <i>Neillia sinensis</i> |
| pallidus roseus | ueki |
| <i>Cephalanthus occidentalis</i> | <i>Pachistima myrsinites</i> |
| <i>Colutea arborescens</i> | <i>Prunus bokhariensis</i> |
| media | <i>Ribes bethmonti</i> |
| <i>Cytisus albus</i> | nigrum |

The Elm Leaf Beetle

More growing pains for interested home owners everywhere in the northeast this year will be caused by the elm leaf beetles, which undoubtedly will be present in large numbers. Mature beetles have been appearing in many houses during the early spring, and by May 15 had made their appearance on some of the elm trees in the Arnold Arboretum.

Last year there was a particularly bad infestation of these beetles in New England. Though many American elms were badly infested, some of the European elms were practically defoliated. As is usually the case in such circumstances, many home owners did not think of spraying until the damage was done, i.e. after the trees were practically defoliated. As a result the larvae ate voraciously and were allowed to mature into beetles. Many of these beetles wintered over in protected nooks and crannies and have already started eating holes in elm foliage this year. Just now, these mature beetles are busily engaged laying their light yellowish orange colored eggs on the under side of elm leaves. One female may deposit as many as six hundred eggs! These eggs will soon hatch and the young larvae will commence eating on the **under** surface of the elm leaves, completing their growth in fifteen or twenty days. The remedy is **immediate** spraying with lead arsenate about 3 pounds to 50 gallons of water using some good "sticker." This should control the pest if the spray be aimed particularly at the under side of the leaves, and may even kill some of the mature beetles before they lay their eggs.

Because the insect is appearing unusually early this year, it may be necessary to spray a second time in order effectively to control the larvae when they appear. The important thing to remember is that if the same trees are allowed to be completely defoliated again this year as were defoliated last year, it will seriously weaken them and one more defoliation next year may be the cause of their death. Our New England elms are worth keeping, and with the Dutch elm disease practically at our door step, it is imperative that we keep these elms in a vigorous and healthy condition.

Willow leaf Beetle and Canker worms

The willow leaf beetle, a small steel-blue beetle, is now actively devouring the foliage of willow trees while the canker worms are eating the foliage of many ornamental trees, including oaks, lindens, elms and crabapples. Both these insects can be controlled by using the same spray as is recommended for the elm leaf beetle.

Garden Cut Worms

Though these are troublesome pests mostly to herbaceous garden plants, they have shown themselves to be present in such large numbers around Boston that they should not be overlooked. Gardeners

will be troubled with them from now until the middle of June. The species which are particularly numerous around Boston this year are the dingy cut-worms. They eat succulent young plants either at or near the surface of the soil. Their numbers are governed from year to year chiefly by the amount of rainfall the previous year, much rain forcing them to the surface where birds and predatory insects eat them or else the excess moisture preventing the females from laying eggs in satisfactory places. From their numbers this year, apparently conditions were ideal for them during May and June last year. About the only method of controlling them now is to sprinkle a poison bran bait over the soil in the early evening, since these cut worms feed chiefly at night. The bait might be made in the following proportions:

$1\frac{1}{2}$ lbs. bran
 $1\frac{1}{2}$ oz. sodium arsenate
 $\frac{1}{4}$ pint black molasses
sufficient water to make a mash

These are a few of our plant troubles this year. Now is the time to control them, while they are actively eating the foliage of trees, shrubs and plants. Do not delay spraying until the damage is done.

Notes

The Oberly Memorial Fund Committee of the American Library Association has awarded the Oberly Memorial Prize for 1940-41 to Dr. E. D. Merrill, Arnold Arboretum, and Dr. E. H. Walker, Smithsonian Institution for their "Bibliography of Eastern Asiatic Botany" published by the Arnold Arboretum. This selection was made in competition, the objective of the committee being to select the most outstanding bibliography in the fields of agriculture and the natural sciences. The Eunice Rockwood Oberly Memorial Fund was established in 1924 and awards are made at two year intervals.

At the annual meeting of the National Academy of Sciences in Washington on April 30, Dr. Karl Sax of the Arboretum staff was honored by election to membership. It is worthy of note that three of the present staff members of the Arboretum are included among the twenty-five making up the section of botany of the Academy. Elections are limited to fifteen in the whole field of science in any one year and Dr. Sax was the only botanist elected this year.

Apparently this season will break all records of visitors to the Arboretum with approximately 43,000 visitors on Lilac Sunday, May 18. Because of the continued cool weather the lilacs and hundreds of other trees and shrubs are still retaining their flowers, making the Arboretum well worth a visit this week end.

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HIBISCUS SYRIACUS

IT was only towards the end of the last century that the native home of *Hibiscus syriacus* was determined to be China and not Syria as Loudon and others of the older writers had supposed. Bean tells us that the travels of Augustine Henry definitely placed the plant, both wild and in cultivation, in the Orient. Like the so-called Persian lilac, it had, presumably, come down over the old trade route to the Near East at some long forgotten time.

But Chinese or not, we shall probably continue to meet with such vernacular references as Syrian rose, Rose of Sharon (probably applicable by right only to some bulbous plant), or Syrian Ketmie. The older European gardeners, noticing the hollyhock-like flowers, used the everyday name of *Althaea frutex*. Being apt, this name has stayed with the plant in all sections influenced by the European tradition. Now, however, Ketmie—an old botanical name for Hibiscus in general—is being revived in England as a common name. That this revival looks to broader horizons may be determined by taking the word on a talking tour. It is Ketmie, or Ketmia, in English, French and German; Chetmia in Italian; Ketmi in Turkish and Khatmiyah in Arabic. Thus the *Althaea* may yet come to be known in gardens as the Syrian Ketmie.

The older estimates of the relative hardiness and particular cultural requirements of the one woody species of Hibiscus have lived on to misdirect us. Parkinson started some of the misunderstanding back in 1629 by rating the *Althaea* so tender that its indicated treatment was pot or tub culture with winter storage in buildings or cellars. Although, in the long years since then, Parkinson's idea has been upset,

there still remains a tendency to place an over-amount of blame for cultural failure with the *Althaea* on an exaggerated supposition of innate tenderness.

Fully as important as inherent hardiness are the factors of suitable soil and environmental conditions. Many instances of *Althaea* loss in northern United States may be traced to the literal application of recommendations of English rather than Continental horticultural writers. Philip Miller's opinion, expressed in 1768, is still being heeded to the inhibition of happy *Althaea* culture. Obviously of but local usefulness was his dictum that "they want light soil, not too wet, for in strong land their stems grow mossy and they never thrive thereafter." Somehow his plea for light, dry soil has too often prompted planting in parched, gravelly hillsides in America. Or, as it is sometimes put, "*Althaeas* need to be put on the driest spot on the place".

The cultural directions set down in nineteenth century France are much more adaptable for our use. Abel Carrière recognized that, while the woody *Hibiscus* wants full sun and can sometimes endure drought or extreme wet, what it really desires is a deep, amply watered soil. His definite advice was strict attention to the watering of plants established in dry places. Personal experience in New England has shown that it is usually less disastrous to err on the wet side in selecting sites for *Althaea* planting. The influence of environmental factors such as these will be reflected directly in the size of the leaves and in the general aspect of the plants while in growth.

Another truth expressed in the French literature, and known to numerous plantsmen in this country, is that winter injury strikes chiefly at young, quick-growing plants. Unless such striplings are protected heavily or taken up and stored for the first winter or so, they cannot be expected to develop size and structure in proportion to their age in the cold north. This killing back or freezing out is not to be expected with older, slower-growing plants. These last may have some twigs frozen but, since the *Althaea* flowers on new wood, such injury is usually superficial. Thus, the *Althaeas* should be introduced into northern gardens in Spring in the form of plants which are old enough and large enough to have developed winter-resistant tops. After planting, their leaves may be very slow in unfolding. Many newly set plants have been so deliberate about showing new growth that they have been given up, erroneously, for dead.

In planting newly purchased *Althaeas*, whether trained as bushes or standards, pruning should follow the practice of removal of whole branches. By this process of thinning, as opposed to severe lopping

back of all upper branches, size of plant is not reduced, more old, weather-resistant branches are retained and fewer winter-tender shoots are induced. Routine pruning of established plants can proceed, when necessary, on this same basis. Pruning of old plants usually need consist of nothing more than the removal of dead wood in spring.

Propagation of the *Althaea* by either leafy or hardwood cuttings is a relatively simple process. However, in the light of the above discussion of tenderness of young plants, it seems prudent to limit its use in northern gardens to the increasing of individual forms not available in the trade.

Although eighteenth century gardeners often grew *Althaeas* from cuttings or layers, they much preferred two other methods of propagation. For increase of the variegated-leaved sorts, they chose to graft on seedling understocks. Strangely enough, *Althaeas* are still being so grafted in this country. Most usually, they grew their plants from seed. By so doing, they had bushes large enough for setting in permanent locations by the end of the fourth year. From the lack of records of introduction, it is reasonable to assume that all of the named forms of *Althaea* are but chance products of this practice, selected out and preserved by alert, but now unknown, gardeners.

While Parkinson noted but two or three varieties, Miller and Hanbury, about a hundred years later, recorded forms with pale purple, dark purple, white, pale yellow and red flowers. Also listed were two forms with variegated leaves. In all of these, the flowers were single and had dark-blotched petal bases. Out of the lot one of the purples might be picked as representing the type flower. As time went on more selections were made, particularly in France at such places as the nursery of Simon-Louis Frères.

With this increase in the number of garden forms, a strange evolution in their names took place. Instead of the simple color designations of the older authors, the nineteenth century knew such varieties as *H. s. flore luteolo pleno*, *H. s. flore roseo striato simplice*, *H. s. flore albo pleno* and others with equally unmanageable Latin descriptions for names. Fortunately, we are today confronted only by simple, obvious garden names, some of which are commemorative and others arrived at by anglicizing of older names. In some known, and probably other uncertain cases, the newer names were bestowed on well-known old forms by rechristening.

Of the newer *Althaeas* now available, a reasonably representative selection could be had by securing the following varieties: In white there are "Totus Albus" (sometimes called "Snowdrift" or "Snow-

storm"), a pure white single; "Jeanne d'Arc" (identical to the old *H. s. flore albo pleno*), a double pure white and "Anemonaeflorus," semi-double with dark center. Red varieties are "Rubis," single, and "Duc de Brabant," dark double. "Ardens" is double lavender-violet. "Boule de Feu" is violet-red. "Coelestis" ("Celeste") is single, purplish blue in flower color. About the nearest to pink in Althaeas are "Lucy," semi-double and "Amplissimus," double. Many others are offered including the hardly desirable variegated-leaved sorts and the varieties with striped petals.

Most of the garden value of *Althaea* centers around its habit of flowering late in the summer when few other shrubs are in bloom. This important contribution to garden interest was not appreciated by the gloomy old author in Curtis' Botanical Magazine when he wrote that "we view it, however, with less delight, as it is a sure indication of approaching winter." While the flowering season often hangs over into the autumn, the leaves of the *Althaea* do not put on any kind of distinct fall coloration. One other seasonal property of the *Althaea* was pointed out by E. Jouin, a French nurseryman. He studied his favorite varieties and was able to classify them as being early, mid-season or late in their relative times of flowering. Of those mentioned above, M. Jouin rated "Coelestis" as early-flowering, "Totus Albus" as mid-season and "Jeanne d'Arc" as coming later than either of the other two.

GEORGE GRAVES

Massachusetts Horticultural Society

Notes

Plants from England. Even with all the difficulties concerning shipping on the North Atlantic these days, the Arnold Arboretum recently received a shipment of live woody plants from Hillier's nursery in England. This was the fulfilment of a normal order placed early in the spring. There were about 100 plants altogether representing fifty different kinds, and though they were en route nearly a full month, they arrived in fair condition and all but four of them will live. None of these plants are represented in living American collections.

Dr. E. D. Merrill, Administrator of Botanical Collections and Director of the Arnold Arboretum, Harvard University, has recently been elected an honorary member of the Royal Agricultural Society of India.

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NUT GROWING IN THE NORTHEASTERN STATES¹

THE Northeastern States have a rich heritage of native nut trees. Among the species occurring in the fields and woodlands are six hickories, the black walnut, the butternut, two species of filberts, the beechnut, and formerly the chestnut. At the present time, however, these species have not been developed in the horticultural sense and so do not form any commercial industry, nor have they been improved by selection and breeding in a way comparable to the Persian walnut or the pecan. The nuts that are grown commercially in America such as the Persian walnut, the pecan, the European filbert, and the almond have all originated either in foreign countries or in the region to the South and West where the climate is better suited for their growth.

The planting of improved nut trees in the northeastern states is thus a comparatively recent development. To be sure nut trees have been given a sort of culture in that they have been left in the fence rows and in the fields that were cleared of other species and seedling trees have been planted around the home grounds from which nuts have been harvested from time to time. Except with the chestnut it is only within the last quarter century that there has been any attempt to improve the nuts grown and to encourage nut culture in any real sense. Such improvements as have taken place have been the discovery of varieties that bear superior nuts and their propagation and testing. In the Northeast this process is still in the exploratory stage and there is yet much to learn as to the adaptation of the various kinds of nut trees to this region.

As the work has progressed it has become evident that the successful production of improved nuts in the Northeast is largely dependent upon the discovery

¹Referring specifically to New England, New York and Pennsylvania. Of course the information would also apply to other regions with similar climate.

of varieties that are adapted to this region. Most of the varieties of nuts which have been selected, named and propagated have originated to the South and West and when brought into the northeastern states have not produced good crops mostly because the climate is not warm enough and the growing season long enough for the normal development of the variety. It seems obvious that for the most part in this region nut culture must be developed from varieties which have originated in the North or in parts of other countries which have a similar climate. The search for varieties adapted to the North has been going on for some time and a considerable number have been named. The time is now ripe for more extended planting of nut trees to determine their adaptability to growth in northern locations. Planting nut trees for shade and as a hobby is to be greatly encouraged because not only are trees of assured hardiness and landscape value available but the grower by testing varieties is contributing to our knowledge of nut culture in the Northeast.

Climatic Factors

With nut trees, as with all other plants, the most important determining factor in their survival and growth is the climate of the region where they are planted. Apparently the limiting factor with many species is winter cold, particularly the absolute low temperatures reached in any one season. Most nut species are long lived trees and although the winters of several decades may not be injurious the occasional exceptional winter may entirely wipe out a given species or variety. This has occurred in parts of the North with the Persian walnut. Previous to 1933-34 there were a considerable number of these trees flourishing in the fruit belt of western New York State, many of which had grown to a bearing size. The unprecedented cold of that season killed most of the trees outright except in a very limited area where the temperature did not fall below -20° F. This temperature is critical not only for most varieties of Persian walnuts but for many varieties of filberts, Chinese and Japanese chestnuts, heartnuts, and some black walnuts. There is little use in planting trees of these varieties if such temperatures are of frequent recurrences. The zones with temperatures above -20° F. over a 15 year period are shown in the accompanying map. (Plate III)

Another climatic factor that is of real importance in the growing of nut trees is the length of the growing season or the number of days between freezes. Practically no species will stand a hard freeze after the growth starts in the spring. These spring frosts rarely kill the trees outright but destroy the new shoots and with them the year's crop. At Ithaca, N.Y., it is probable that this killing of the new growth on hickories and walnuts is responsible for crop failure more often than any one other factor. The leaves come out from other buds after the freeze and during the growing season the trees appear normal except for the fact that there is no crop. Most of our nut tree species require a growing season of at least 150 days between frosts although butternuts and filberts may require less. The

Map showing absolute minimum temperatures in Northeastern states from 1926 to 1946. A temperature of -20°F is critical for some kinds of nut trees.

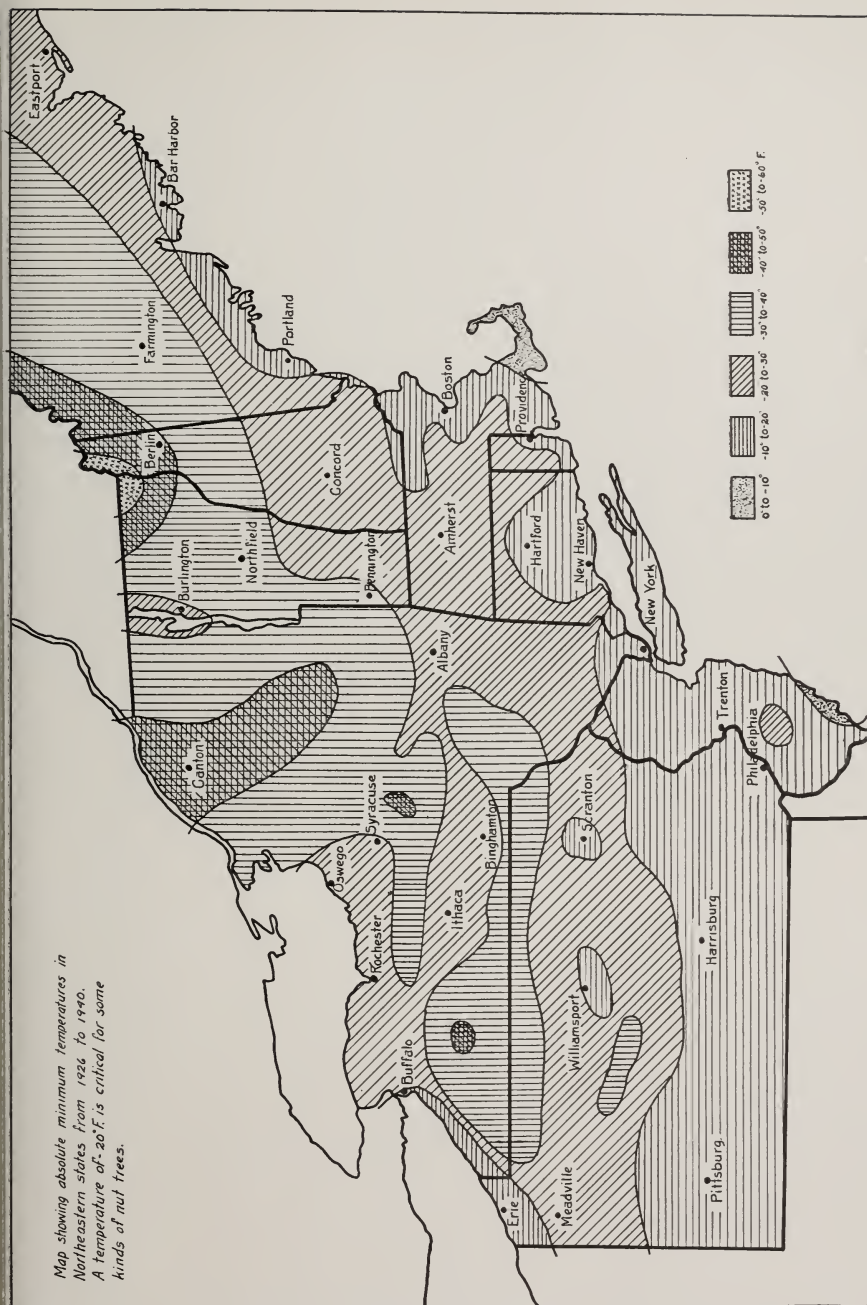


PLATE III. Note: The maps have been prepared from data supplied from the U.S. Weather Bureau publications modified in the light of other known climatic and geographical features. The zones are only approximate and local conditions such as altitude, exposure and nearness to bodies of water may have an important effect on the growth of trees.

length of the growing season for the various parts of the northeastern states is shown on the accompanying map. (Plate IV)

Somewhat less damaging than late spring frosts are freezes which occur in early fall. Black walnuts are particularly likely to be damaged at this time. The nuts on the trees will not be hurt by light frosts but if the temperature goes to $+25^{\circ}$ F. or below there is likelihood that not only will the leaves be frozen off the trees but the nuts themselves will be frozen so as to make them poorly flavored and useless. In many cases if the leaves are frozen from the trees the development of the nuts will stop and the nuts are poorly filled. Early fall freezes, if the drop in temperature is rapid and occurs before the growth on the trees has hardened, may cause serious damage to both trees and nuts.

Associated with the same problem as the length of the growing season between frosts is the mean summer temperature sometimes expressed as total summer heat. Varieties of fruit trees, nuts included, require a certain amount of heat above a base temperature in order to develop well-filled nuts. Thus, even though the growing season may be sufficiently long, if the temperature during the growing season is too low, nuts will not mature. This is particularly important with those species that normally grow farther South such as the northern pecan from Illinois and many of the black walnut varieties. These trees may be perfectly hardy as far as winter low temperatures are concerned but they rarely mature a crop because of cool summers and the short growing season. Sometimes exceptionally warm seasons will mature nut varieties in a region where they usually fail to ripen. The same thing is also true of grapes and other fruits.

Local variations in climate are often important in determining the suitability for growing nut tree species on a particular site. On the accompanying maps the climatic zones are indicated in a general way. Within these zones, however, there may be certain sites which are more favorable for the growth of nut trees than others. These sites are related to proximity to bodies of water, good air drainage, protection from winds or other favorable factors. An example of such a site has been observed at Aurora on Cayuga Lake, N. Y. Here on a certain bench close to the lake and surrounded by rather high banks, a number of species were growing for many years that were not adapted to the surrounding region. These included a California redwood, a number of Persian walnuts and a few northern pecans. These trees had grown to considerable size and had produced satisfactory crops but in the winter of 1933-34 the lake froze over for the first time in many years and the temperature on a single night dropped to an unprecedented low point. All of the trees except the pecans were either killed or badly damaged. Advantage should be taken of such locations wherever they occur. On the other hand exposed hillsides, frost pockets, and high elevations should be avoided.

From the above discussion of climate and an examination of the maps, it becomes evident that parts of the Northeast differ greatly in their suitability for grow-

Map showing an average length for growing season in the Northeastern states. Growing season of at least 150 days between frosts is essential for many kinds of nuts.

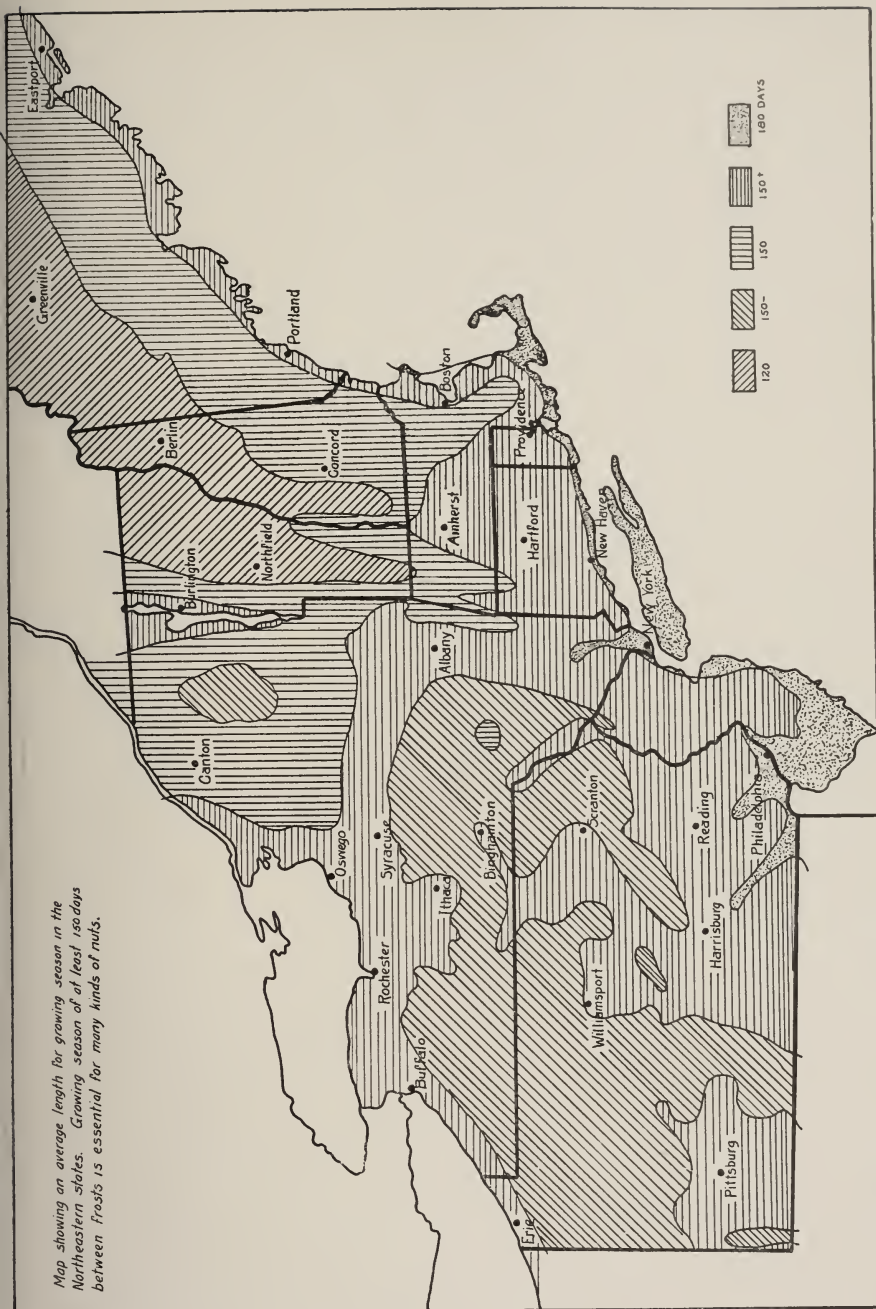


PLATE IV. See Note under Plate III.

ing nut trees. In northern New England, particularly Maine, New Hampshire and Vermont, only a few of the most hardy kinds such as the butternut can be grown. In southern Pennsylvania, however, most species and varieties will succeed. In between these areas conditions become increasingly less favorable from South to North, the suitability of any locality being influenced by local factors that effect temperature, air drainage, and the like.

Species and Varieties

As before indicated, the problem of growing nut trees in the northeastern states is largely a matter of varieties and their adaptation. The greatest concentration of the more valuable native species, particularly the black walnut and the shagbark hickory, is in the Mississippi River basin, particularly the Middle West. Named sorts originating in these regions are probably not adapted to northern New York or New England and should be planted with the realization that it is an experimental project or else there should be assurance based on tests that the varieties will succeed. The probable solution of the problem is to obtain varieties that have originated locally or under similar climatic conditions and are of proven worth.

BLACK WALNUT: The black walnut, although primarily a plant of the Mississippi River basin and the region of the Great Lakes, is hardy in most parts of the Northeast and one of the most valuable nut trees for the region. It is extensively planted around the farmsteads in southern New England and southward and has escaped along the fence rows and in waste places where it is not native. Most of the varieties which have been named and propagated originated to the West and South of New England and have not proved suitable here. At Ithaca, New York, the variety Thomas has been one of the most successful but apparently this is about the limit of its northern range and even here there are seasons when the nuts do not mature. Other varieties extensively propagated such as "Ohio" and the "Stabler," do not mature at Ithaca or farther North. Varieties of northern origin have as yet not been sufficiently tested to be sure of their behavior in New England. They are, however, the most promising for this region and are well worth a trial. Among these can be mentioned the "Tasterite" and "Snyder" from the Ithaca region, the "Wiard" and "Allen" from Michigan, the "Kettler" from Wisconsin, the "Clark" from southern Minnesota and the "Cresco" from northern Iowa. These are being propagated sparingly by nurserymen and could be propagated to order if the grower so desires.

Those interested in nut culture should observe trees growing in the northern part of the black walnut range and select those which produce the best nuts over a period of years. These can be propagated by nurserymen on order or grafted by the individual himself. It is only by such selection from trees that are successful that progress will be made in the varietal adaptation of nuts to a northern environment.

Map showing the average July temperature in the Northeastern states for the years 1926 to 1940. July temperature is a good indication of amount of heat necessary for maturing nut crops.

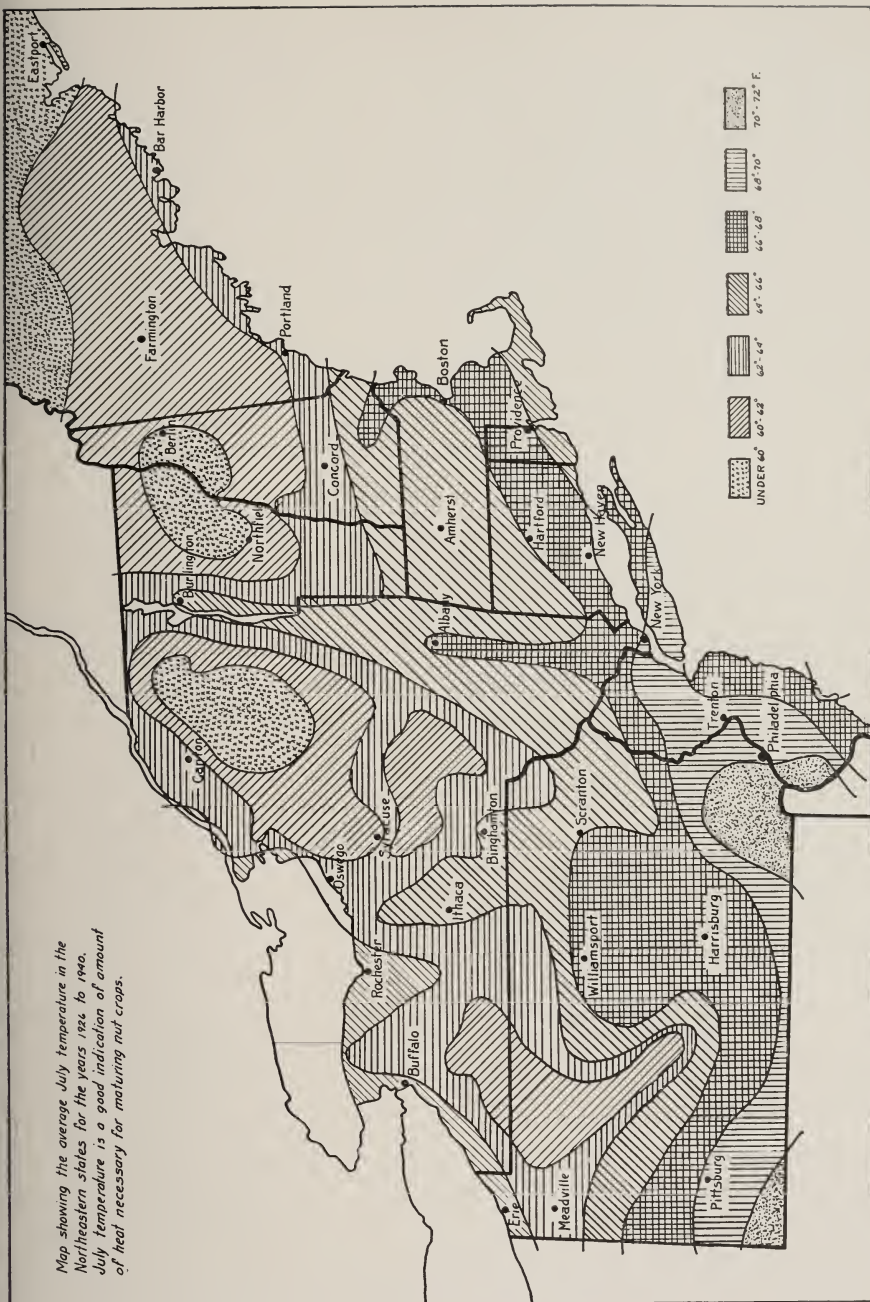


PLATE V. See Note under Plate III.

The variation in cracking quality and size of black walnuts is great. Some of the better sorts may have as high as 35% kernel although 20% kernel is good and most common seedlings have considerably less. Black walnuts are best adapted to deep, rich, slightly alkaline or neutral soils with good drainage. They are found growing naturally in alluvial soil in the river valleys. In the North such sites should be avoided if they are "frost pockets."

BUTTERNUT: The butternut extends the farthest North in its natural range of any of the important nut trees and in fact in northern New England is about the only nut which will succeed. Here it should receive much more attention than it has in the past. It has the disadvantage of being rather short lived under some conditions. The cause of this in some cases is a parasitic fungus but in others it is apparently related to the nature of the tree itself.

Although the butternut will succeed fairly well on the poorer upland soils it thrives best on richer neutral soils with good drainage. A dozen or more varieties have been selected but only a few have been propagated commercially. Some of the named sorts that are propagated by nurserymen, at least in small quantities, are the "Kenworthy," "Irvine," "Love," "Sherwood," "Thill" and "Van der Poppen." For some unknown reason the butternut is not easily propagated. Named varieties certainly deserve much more attention than they now receive because of their very superior cracking quality as compared with the ordinary run of seedlings.

PERSIAN WALNUT: Attempts have been made to grow the Persian or English walnut in the Northeast for many years with recurring damage from winter cold. Trees in the protected fruit regions of New York became large enough to bear good crops until the extreme cold winter of 1933-34. At that time practically all Persian walnuts in the East were either killed outright or very severely damaged. Apparently the temperature of -20° F. becomes critical for most trees of this species and quick drops in temperature in spring or fall may be injurious at higher temperatures.

At the present time there is a very real interest in what are known as the Carpathian walnuts which have been introduced from Poland by Mr. Paul Crath of Toronto, Canada. These trees are grown from seeds or grafts from trees in the Carpathian Mountains which have withstood temperatures as low as -40° F. Some of these trees have been growing in North America in both Canada and the United States for a dozen years or more and show promise of successful culture. The seedling trees are now beginning to fruit so that in the near future more accurate information regarding their behavior should be available. At the present time they offer promise of establishing Persian walnuts in the Northeast. Trees are available mostly as seedlings in both the United States and Canada. It should be borne in mind that even though the Carpathian walnut is hardy there may be other climatic factors which are limiting in their culture, such as length of growing

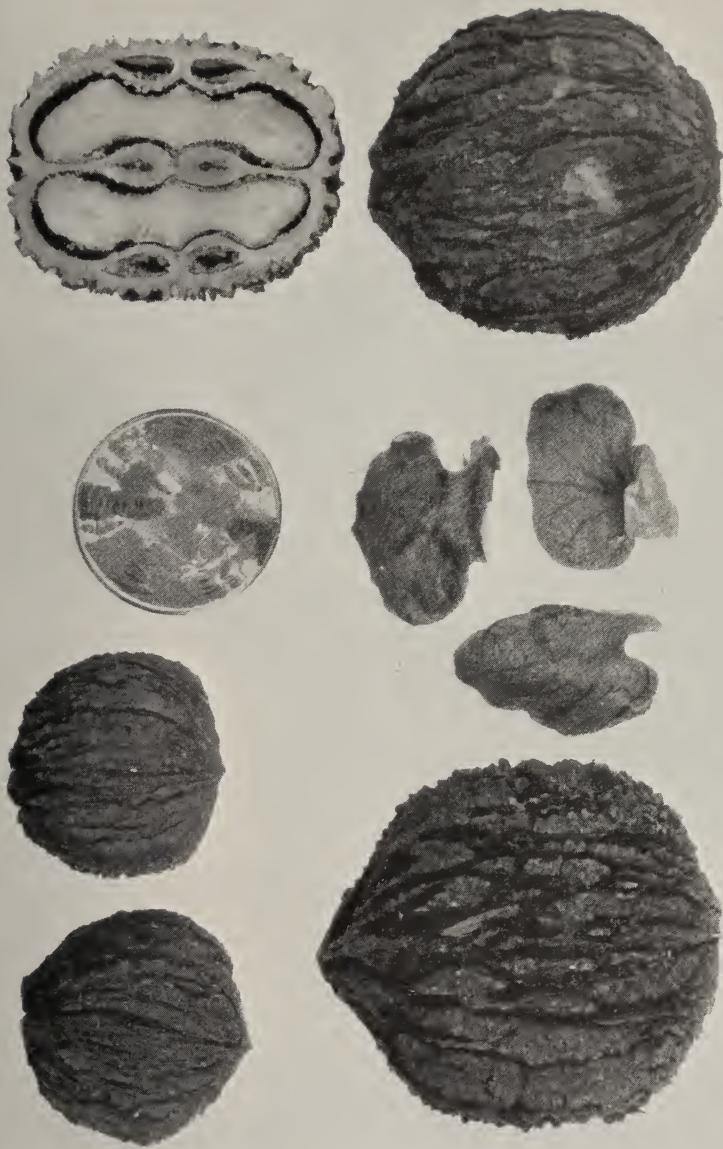


PLATE VI

Black walnuts. The nuts at the left show large and small variations. The one at the right is the Snyder variety, originating near Ithaca, N. Y., and has good cracking quality. The disk is slightly larger than a twenty-five cent piece.

season or the amount of summer heat available. Indications are, however, that they are adapted to relatively short seasons and they have shown little killing back from winter cold. As yet there are no named varieties in the trade.

JAPANESE WALNUT: The Japanese walnut (*Juglans Sieboldiana*) makes rapid and luxurious growth even in rather poor soils and is well adapted for use as a shade tree. It comes into bearing early and has a tropical appearance which is very pleasing. Seedling trees vary considerably in their hardiness but for the most part withstand winter cold in all except the most severe parts of the Northeast. At Ithaca, many have withstood temperatures of -35° F. without damage. On the other hand there are some seedlings which have been damaged at -20° F., and early fall freezes may be damaging at higher temperatures. The nuts of the Japanese walnut resemble the butternut in flavor of the kernel, but in general are not so highly flavored. Some types of this nut are fairly smooth whereas others are rough much like the butternut. It was thought that these rough nuts were hybrids with the butternut, but the fact that such rough nuts occur in Asia where there are no butternuts indicates that they are probably only a form. The name *buarntnut* is used for Japanese walnuts of the rough shelled type. As yet there are no named varieties of this nut.

HEARTNUT: The heartnut (*Juglans Sieboldiana*, var. *cordiformis*) is a sport or mutation of the Japanese walnut resembling it closely in foliage and growth habit. The nuts have much better cracking quality, however, and with most of the named sorts kernels can be recovered whole. The shells of some of them can be split apart with a knife inserted in the base of the nut. The nuts are smooth and attractive in appearance and although usually smaller, they are much superior to the ordinary forms of the Japanese walnut. There is variation in hardiness of the different named varieties and at the present time it is impossible to give a well substantiated opinion as to the adaptation of the named varieties to northern culture. The "Lancaster" has not been hardy at Ithaca. Other sorts in the trade are the "Bates," "Faust," "Ritchie," "Stranger," "Walters" and "Fodemaier." Anyone interested in planting this nut will do a real service by keeping records of their performance and giving the information to experiment stations or the Northern Nut Growers' Association.

HICKORY NUT: A number of species of hickory are native in the Northeast. Among these are the mockernut (*Carya alba*), the shagbark hickory (*C. ovata*), the red hickory (*C. ovalis*), the pignut (*C. glabra*), the bitternut (*C. cordiformis*) and the shellbark hickory or kingnut (*C. laciniosa*). Of these the shagbark hickory is by far the most important. Mockernuts are gathered to some extent from the wild but are undesirable because of their thick shells. The pignut is usually not bitter but with few exceptions is of such poor cracking quality as to be of little value.

The bitternut is intensely bitter, astringent and quite inedible. Some of the hybrids with the shagbark hickory have been propagated because of their thin shells but are of poor cracking quality and flavor. The problem of growing hickory nuts in the Northeast is much the same as with the black walnut. Although many sorts have been named a large part of them have their origin in the South and West and when brought into the Northeast are not successful because of the short growing season and lack of heat. The Northeast must rely on varieties which have originated in the northern states. Among these may be mentioned "Davis," "Fox," "Glover," "Goheen," "Kirtland," "Mann," "Miller," "Nielsen," "Whitney," "Beeman," "Bridgewater" and "Wilcox." Most of these were reported in some of the nursery catalogs in 1939 and many of them could be propagated on order.

One factor standing in the way of increased planting is the difficulty of propagating the trees. Young hickory stocks have a very large tap root, making the trees difficult to handle in the nursery. This can be surmounted by cutting the tap root about 18 inches underground at least a year before transplanting, thus forcing lateral roots to form. Well managed nurseries provide for this and such trees are much more likely to succeed than those transplanted from the wild.

PECAN: The pecan so extensively grown in the cotton belt and extending in its natural range into parts of Indiana and Illinois, has not been successful in the Northeast. This is not because of tenderness to winter cold but rather to the relatively short, cool growing seasons which do not mature the nuts.

There are a number of hybrid varieties which make good shade trees. Among these the "Burlington" is particularly attractive. It has been perfectly hardy at Ithaca, has good clean foliage and occasionally has matured a few nuts. Usually they have been frozen on the trees before maturing. The "McCallister" is a very large nut but the trees have not been hardy in the Ithaca region and the variety is not recommended. Other hybrid sorts such as the "Gerardi," the "Des Moines" and the "Pleas" have attractive foliage and make good shade trees.

In favorable locations in southern Pennsylvania some of the northern varieties of pecans occasionally mature crops of nuts. Anyone planting these should use varieties which are of northern origin. Among these are the "Greenriver," "Major" and the "Posey."

CHESTNUT: In the past the chestnut has been by far the most valuable of the nut trees in the Northeast. The wild groves of this species have, however, been almost completely destroyed by the chestnut blight. This disease, coming into the New York area about 1900 has now covered practically the entire native range of the chestnut in North America. All that is left of the great chestnut forests are the dead trunks and stumps often with sprouts coming up from the base. These sprouts live from year to year, their usual history being that they grow until they

are about two or three inches through and 10 to 15 feet high. At this stage the bark forms fissures through which infection occurs with the result that the sprouts are killed and are replaced with suckers from the base. Sometimes these sprouts become large enough to bear a few nuts and there are constant rumors that the chestnut is coming back in the forests. This, however, does not seem to be the case as **there are no recorded instances of real immunity among trees of the native chestnut.** There has been a persistent attempt on the part of the federal government and some state forestry departments to introduce or develop other species or hybrid varieties of the chestnut which would be resistant or immune to the blight. In this some success has been achieved. The Chinese chestnut (*Castanea mollissima*) and the Japanese chestnut (*C. crenata*) although not immune to the blight are highly resistant. Hybridizing these with each other and with the native American species to obtain blight resistant types is underway. There are at the present time a number of varieties that are distinctly promising. Among these are "Abundance," "Carr," "Hobson," "Homan," "Stoke," "Reliable" and "Yankee." These are available from nurserymen and are well worth a trial. Many of the nuts are fully as sweet as the native chestnut, and considerably larger. The trees are not as hardy as the native chestnut and may be damaged by temperatures ranging around -25° F. There undoubtedly is great variation in hardiness in these varieties and they should be tested further.

FILBERT: Two species of native filbert occur in the Northeast. One of these is the beaked filbert (*Corylus cornuta*) and the other the American filbert (*C. americana*). These, however, are relatively inferior as compared with the European species, *C. Avellana* and *C. maxima*, which together with their hybrids are the basis of the world's commercial industry. In New York tests have been made at the Geneva Experiment Station where a large number of varieties of European filberts have been grown. The limiting factor with most of these has been winter cold and late spring frosts. Temperatures of -20° F. have seriously injured many of the European varieties and late frosts frequently destroy the staminate catkins or pollen producing flowers and thus prevent a crop. The variety recommendations G. L. Slate based on experience at Geneva, New York is as follows:

"Cosford" and "Medium Long" are two of the hardiest varieties and with the exception of "Italian Red" are the most productive. Both have vigorous, upright trees. "Cosford" nuts are of medium size and thinnest shelled of all varieties tested. The nuts of "Medium Long" are slightly larger than those of "Cosford" and the shell is of medium thickness. The pellicle or fiber on the kernel is rather heavy.

"Italian Red" has thus far produced more nuts than any other variety tested, but at the Geneva Experiment Station in recent years the tree has not been as hardy as it appeared earlier and the variety is placed third on the list. The tree is vigorous and upright.



PLATE VII

Hickory nuts of various types. The large nut is the kingnut or shellbark hickory (*Carya laciniosa*). The nuts on the right are superior types with good cracking quality. The disk is slightly larger than a twenty-five cent piece.

“Barcelona” in the earlier years of the test was the most productive variety, but recently the trees have experienced so much winter injury that the variety is recommended for limited trial only. The nuts are large, thick-shelled, and the kernels are covered with a heavy pellicle, but the tree is less vigorous than others, not productive, and is lacking in hardiness.

“Red Lambert” is as hardy as “Cosford” and “Medium Long” and produces a fine large nut, but the tree is unfortunately very unproductive and of value only as a pollenizer. Its spreading habit of growth makes it unsuitable for planting in a hedge with other varieties, most of which are of upright habit.

More recently a promising development in the filbert situation is the hybridization of American with European varieties. The varieties “Rush” from Pennsylvania and “Winkler” from Iowa of the American species are the varieties most used. “Rush” is a tall growing shrub and has borne well at Ithaca. “Winkler” is hardier, more productive and bears larger nuts, but makes a low growing shrub. Of the hybrid varieties the “Bixby” and “Buchanan” are now regarded as being the most promising because of their size and other merit of the nuts and hardiness of plant. Many other seedlings are being tested and seem promising.

Cultural Practices

It is not the purpose of the bulletin to give details as to the propagation of nut trees. In general the same principles are involved with this crop as with other fruit trees but the material is somewhat more difficult to manipulate and wholly efficient methods of budding or grafting have not been developed. It should be emphasized here, however, that in common with other fruit species, grafted trees are very much superior to seedlings. Nut varieties might very well be compared to apple varieties in this regard. Anyone who is familiar with the small, hard natural apple fruit which is found in the pastures of New England and knows of its bitter, astringent flavor can appreciate the difference between these and the better named grafted varieties such as the “Baldwin” and “McIntosh.” The same differences exist with the nut trees also. The great majority of seedling nut trees have nuts that are so difficult to shell that there is little incentive to grow them. The named and grafted varieties, however, may be said to be as superior to the ordinary run of seedlings as the grafted apples are superior to natural fruit. Better varieties of nut trees should bear nuts of good size which have a high proportion of good quality kernels which are easily shelled out. It is not difficult to imagine what a difference it would make if the many millions of wild trees bore nuts of as good quality as the selected and named sorts.

Obtaining trees of desirable varieties may be something of a problem. Many varieties are already in the trade and are being propagated by nut tree specialists. It is also possible to have particular varieties propagated to order. It must be realized, however, that nut trees are much more difficult to produce in the nursery

than are apples or pears and in justice to himself, the nurseryman is compelled to charge more for the nut trees than for other fruit trees.

For one really interested in the growing of nut trees a good practice is to top work established stocks by grafting. It is not too difficult to learn the technique and in many localities there are nurserymen and plantsmen who will make grafts as desired.

To grow seedling stocks it is necessary to stratify the seeds before planting. This should be done in the early fall before the nuts have been allowed to become very dry. The process of stratification involves keeping the nuts at temperatures slightly above freezing. Best results are obtained by keeping nuts buried in moist peat moss at a constant temperature of about 35-40° F. Such conditions may be found in cold storage houses. For the grower, successful stratification can be attained by exposing the nuts to winter temperatures. This is done by burying the nuts in sand and leaving them in an exposed place which should be well drained. Protection with wire netting is necessary to keep rodents from destroying the seeds. If danger from theft by rodents is not likely and the soil is well drained, the seed nuts may be planted in the nursery row in the fall or they may be planted in their permanent location in the fall or the stratified nuts planted out in the spring.

Those desiring only a few nut trees of named varieties may best purchase them from nurserymen who are specializing in nut tree propagation. There are a number of these in the Northeast and Middle West. A list of nurserymen can be obtained from the Northern Nut Growers' Association. If nut growing is to be carried on as a hobby and a considerable number of trees are to be involved, a good practice is to raise seedlings and get them established in their permanent location and then graft the most vigorous individual trees to well-chosen varieties. Scions may be obtained from trees locally or from nurserymen who furnish scions.

Soils suitable for nut trees are the same as those required for almost any other fruit crop. The first requirement is that they shall be deep and well drained. Thin topsoil overlying impervious subsoils which remain soggy will not grow good trees. Often rocky soils are very good because they usually are well drained unless the underlying rock is impervious. The most favorable soils are friable loams of good organic content and good moisture holding capacity. Fertility can be easily supplied to poor soils which are suitable in texture and drainage by the use of leguminous cover crops, and by application of barnyard manure or complete commercial fertilizers. It is a mistake to plant nut trees on heavy, worn-out soils that are not good agricultural lands. On the other hand they may very well be planted in rocky lands incapable of cultivation provided other conditions are favorable.

The planting of nut trees does not differ essentially from planting trees of other kinds except possibly that most nut trees have few fibrous roots and hence must be planted with unusual care. Hickories are difficult to transplant because of the scarcity of lateral roots and the slow rate at which new roots are formed. If the

taproot has not been cut a year previous to digging or the tree transplanted in the nursery row once or twice, there are likely to be practically no fibrous roots and the chances of survival of the tree are slight. If seedling trees are to be brought in from the woods, it is of great advantage to cut off the taproot about 18 inches below the surface of the ground a year before transplanting and thus stimulate the formation of the lateral roots near the surface. There is an advantage in buying trees from nurserymen skilled in the propagation of nut trees because attention is given by them to developing a good root system.

While the trees are out of the ground, care should be taken not to allow the roots to become dry before planting. Keeping them covered with wet burlap or puddling them in a moist clay is highly important. Some trees can be bought balled and burlapped but this is expensive and should be unnecessary. The hole should be dug large enough so that all of the roots can be accommodated readily and the topsoil should be worked in carefully around them. One of the most important practices is to firm the soil about the roots with a tamping stick of some sort. At the time of planting the soil should be moist but not wet enough to puddle or cake when firmed with the tamper. After planting, the trees should be well watered and weeds kept down about the trees either by cultivation or by mulching. This is particularly important until the trees become established. At the time of planting the tops of practically all nut trees should be cut back to about one-third or one-half of the wood present in the nursery, making sure that at least several good buds remain. This is important because even with carefully dug trees a large proportion of the root system is destroyed or damaged in digging and the top must be cut proportionally. After planting, if the season is dry, the trees should be watered during dry periods of at least the first season or longer if necessary until they become established.

On soils that are low in organic matter a good practice is to work in granulated peat moss with the soil about the roots. Care should be used that the peat is well soaked with water either before or after the planting, otherwise it will be of no benefit. Covering the trees with wax has been recommended by some authorities but under conditions of hot sun this practice has proved injurious and is not recommended.

After the nut trees become established not much care is needed. Pruning is of less importance than with most fruit trees. With walnuts and hickories it is sometimes necessary to correct faulty crotch structure and space the limbs about the trunk. The most common fault is the development of two leaders which are about the same size. If this occurs one should be removed or at least pruned severely to dwarf it with relation to the other. Hickories and walnuts should be so trained that central leaders, or modified central leaders will develop. For best yields filberts should be trained as standard trees without suckers at the base. In removing a sucker, the soil is dug away from the base of the tree exposing the base of the

sucker where it joins the root and the sucker removed with a sharp saw, cutting close to the main root.

Fertilizers

Nut trees respond to fertilization and good soil management much as do other fruit trees although many wild trees apparently do well in competition with other vegetation. Outstanding growth or yield is usually associated with an unusually favorable situation as to soil fertility, moisture supply or other soil conditions. It is a mistake to think that nut trees will survive under adverse conditions, and neglect, especially before the trees are well established, will often result in the loss of the trees. Nut trees do particularly well under cultivation which keeps weeds and other growth away from the soil over the roots. This, however, is rarely practical with nut trees in the fence row or around the home. The benefits of cultivation can be largely secured by mulching the area under the trees so that the weeds are kept under control. Any plant material such as old hay or straw or garden refuse is suitable for mulching purposes.

On soils low in fertility nut trees will respond to applications of nitrogen. Either sodium nitrate or ammonium sulfate may be used, the former probably being preferable with the walnuts which are adapted to neutral or alkaline soils. Trees growing in sod may be fertilized at the rate of $\frac{1}{4}$ pound of ammonium sulfate or sodium nitrate for each inch of the diameter of the trunk until they have attained a diameter of about 6 inches when about $\frac{1}{2}$ pound may be used for each inch in diameter up to the maximum of 15 to 20 pounds per tree. With large trees that are well established, much more fertilizer should be added. The above is of course only an approximation. The actual needs of the tree will depend upon the natural fertility of the soil and other conditions. The trees should be observed carefully to avoid either excessive stimulation of growth, which would make the trees liable to winter injury, or the other extreme of an under-vegetative condition as indicated by yellow, sparse foliage and poor yields. In general trees suffer much more from the lack of fertility than from too much. If trees are to yield regular crops they must be fertilized regularly and adequately. There is little evidence to show that phosphorus and potassium or the other minor fertilizer elements are an advantage in the soils of the Northeast.

Insect and Disease Troubles

Insect and disease troubles are about as common for nut trees as for any other shade trees. The problem is complicated by the fact that most home owners cannot have their trees sprayed. There are a number of caterpillars which destroy the foliage. Among them, most commonly encountered is the walnut caterpillar which appears about mid-summer and may seriously defoliate the trees one or more times in a single season. These may be controlled with arsenate of lead. Where the trees are not sprayed it is often possible to destroy the worms by collecting them when

they gather on the trunk in a mass to shed their skins. These caterpillars and others on hickories can often be destroyed before they attain large size by picking off the leaves upon which they are feeding. They usually feed in groups close together. Hickories and chestnuts sometimes have the nuts destroyed by weevils. The control here is to destroy all nuts which drop to the ground before the weevils emerge. This may be fairly easy if the trees are in the lawn but difficult if the ground is rough. The Persian walnut is attacked by the codling moth, which is similar to that which damages apples. Spraying with arsenate in mid-summer when the moths appear is an effective control.

Diseases are usually not troublesome with nut trees although under some conditions they may be. There is a blight which sometimes attacks the filberts, appearing as dead and brown shoots. If affected parts are cut out promptly and burned, the trouble is usually easy to control. Some varieties of walnut, particularly the "Thomas," become infected with a perennial canker. This is relatively less damaging on trees that are growing rapidly so that good cultural practice is a means of control. Of course the chestnut blight has been the most devastating disease of nut trees which has practically wiped out the chestnut in its natural range. Methods of controlling this disease in the American and European chestnuts have not been developed. Of the blight resistant Chinese and Japanese species, it is worthwhile to cut out blighted limbs as they occur and to cut away bark cankers on the trunk. The cut surfaces should be painted with some good antiseptic solution.

Nut trees, particularly the hickories and walnuts ordinarily bear only in alternate years. This is a natural tendency which is to be observed also with other fruit trees. There is apparently little that can be done to control it although it may be lessened somewhat by an adequate fertilizer and soil management program. Thinning the nuts while still green should also be of help but is not practiced. What happens is that during the bearing year the crop is such a heavy drain on the food manufactured in the leaves or possibly other substances, that there is not enough for bud formation for the following year. Different varieties vary in this respect. The chestnut and the filbert do not alternate as seriously as the walnut and the hickory.

Cross Pollination

Most kinds of nuts require cross pollination. From a practical standpoint this means that at least two varieties of each species which flower simultaneously should grow together. With kinds that are frequently planted this may offer no problem to the individual home owner as neighbors may have trees which will be a source of pollen. With the filbert and chestnut, however, two varieties should always be planted together. To a somewhat lesser degree this is the case with the Persian walnut and the hickories. The pollination requirements of black walnut are not well understood but it is highly probable that cross pollination is necessary for

this species also. In small areas where several trees cannot be planted, a part of the tree may be top worked to another variety. The pollen of the walnut, filbert and hickory is wind borne and may be carried over a considerable distance. It is impossible to state with accuracy how close together it is necessary for trees to be planted for cross-pollination. Anywhere within the radius of 100 feet should be satisfactory.

Harvesting Nuts

Nuts should be allowed to become fully mature on the trees and preferably to fall naturally. Mild shaking is sometimes practiced to bring down the last of the crop but clubbing the branches is seldom justified. Nuts should be picked up as soon as they fall. This is particularly necessary with the Persian walnut which discolors if allowed to lie on the ground and with the black walnut, the husks of which may disintegrate into a brown mass if not picked up within a few days after falling. Black walnuts should be shucked soon after harvesting to prevent discoloration of the kernels. Small quantities of black walnuts are beaten or tramped from the husks. With larger quantities the old fashioned corn sheller may be adjusted to remove the husks satisfactorily. Black walnuts that are washed immediately after removing the husks will remain an attractive brown color instead of turning black. Nuts of all species should be allowed to dry after the husks are removed. Small quantities can be spread out on the floor of a well ventilated shed or attic. With larger quantities some sort of racks with screen bottoms can be devised. The drying room must have a free circulation of air.

One of the commonest difficulties experienced with nut trees in the North is that the kernels fail to fill. There are a number of causes which contribute to this condition. Probably the most frequent, particularly with the hickories and walnuts, is too short a growing season or too little summer heat. Under these conditions the leaves are frozen from the trees while the nuts are still immature and no further development of the kernels takes place. The problem may be better understood when it is realized that in the development of most kinds of nuts, the growth of hull and shell to full size takes place early in the season. During the latter part of the season the kernels are developed from the carbohydrates which are manufactured by the leaves. It is thus obvious that any condition which cuts down the effectiveness or destroys the leaf surface will effect the filling of the nuts. This may be due to loss of leaves by insects or diseases or to interference with their effective function by drought or inadequate nitrate supply. Another condition is found in trees in an over-vegetative condition where the growing shoots use up the food materials which otherwise might go into the kernels. This is apt to be found with young rapidly growing trees or trees kept growing with frequent irrigation. There is little that can be done to control the failure to fill except to grow varieties which are adapted to the locality as to length of growing

season and protecting the leaf surface from pests and disease troubles. Supplying water at time of drouth and a good fertilizer program are also helpful.

Summary

In the foregoing pages an attempt has been made to outline the requirements for growing nut trees in the Northeastern states. There is nothing in the situation which should encourage anyone to try to establish commercial plantings in this area unless possibly with some of the newer chestnuts and some varieties of black walnuts. On the other hand it should be emphasized that there is real value in planting grafted trees throughout the Northeast both for shade trees and for the nuts which may be produced for home use. The fact that at the present time we do not know which varieties will succeed best over a period of years only adds to the interest of the problem. Enough is known to assure the growing of good shade trees and certainly in some measure improved nut crops will result. Nut kernels are a product that is without equal for food value and palatability, and producing a supply for home use merits the attention of all who have land at their disposal.

All home owners in the villages and on the farms may be encouraged to plant nut trees for shade with the realization that even though large crops of superior nuts may not result, the testing of the varieties will be a real service in developing our knowledge of nut growing in the Northeast.

It should also be emphasized that at the present time there are undoubtedly many superior varieties of nut trees that are adapted to growing in various localities but which have not been propagated and tested. They are standing as wild trees in the fields and along the fence rows on the farms or in dooryards. Trees which bear nuts of outstanding value and which bear crops fairly regularly should be brought to the attention of some agency which would be capable of judging the relative merit of the variety and seeing to it that the tree is propagated and tested further. The Northern Nut Growers' Association, G. L. Slate, secretary, Geneva, New York, has been organized to do this sort of thing. Some of the state experiment stations and the United States Department of Agriculture are also equipped to test the merit of new varieties. Anyone knowing of superior trees will do a real service by calling them to the attention of one of these agencies.

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ARNOLDIA



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ELMS GROWN IN AMERICA

TWENTY-FIVE years ago, Professor Charles S. Sargent, Director of the Arnold Arboretum wrote the following statement concerning the European Elms—unfortunately just as true today as it was then—
“There is probably more confusion in the identification and proper naming of these trees (the European elms) in American parks and gardens than of any other group of trees, and it is only in very recent years that English botanists have been able to reach what appear to be sound conclusions in regard to them. The confusion started with Linnaeus, who believed that all European elms belonged to one species, and it has been increased by the appearance of natural hybrids of at least two of the species and by the tendency of seedlings to show much variation from the original types.”

Today, with six elm species native in the United State, five species native of Europe (including many varieties), and several more species native of Asia, the picture becomes even more confused. The elm is, and always has been, a standard shade tree, for even though it is threatened in certain sections by the Dutch elm disease, the gardening public will still plant elms. Approximately fifty elms will be mentioned in this bulletin. About thirty of them have been listed as available in the nurseries of this country during the past two years: all but five of them are growing in the Arnold Arboretum at Boston.

The Native American Elms

Of the six native American species, only three are of ornamental value—the American elm (*U. americana*) and its varieties, the slippery elm (*U. fulva*), and the winged elm (*U. alata*). The winged or wahoo

elm is hardy only in the southern United States, being native from Virginia to Florida and westward to the Mississippi River and Texas, while the other two are native throughout the East and Mid-west. These species are easily distinguishable and little reason exists for any confusion. A key based on foliage characters is appended to this paper.

Rich in references in the early history of the United States, the American elm is the most outstanding and the most deserving of all the elms. It is widely distributed throughout southern Canada, as well as the eastern and the mid-western parts of the United States. In early colonial times, it was under numerous stately specimens that important meetings and many important events took place. Some of these historic elms are still standing today and are well over a hundred feet in height. Many a community in the eastern and mid-western United States has its own local history closely tied to some huge elm which is yet living; and it is the consensus of opinion in hundreds of communities that it would be a dire calamity indeed if the use of the American elm were discontinued in landscape work.

There is no ornamental tree just like the American elm. Its wide, vase-shaped form is unique, making it an excellent specimen for lawn and for street planting. Its lofty branches allow much air circulation underneath and, though the tree supplies perfect shade, the widely arching branches do not hinder views from houses. This habit, characteristic of the American elm, is much more evident in mature specimens than in younger trees. Since the habit varies considerably when the trees are grown from seed, it is advisable to propagate vegetatively those individuals of outstanding form. Strange enough, it is, like the white oak, one of the few of our native trees that does not thrive well in Europe.

Several recognized varieties give clear evidence of the diverging habits of the American elm. There is, for instance, the variety *columnaris* with rather upright branches forming a wide columnar head. The variety *ascendens* is more narrow, distinctly columnar. Other columnar or narrow pyramidal forms would include the "Lake City" elm, the "Moline" elm, and the "Princeton" elm. Sometimes a variety "urni," or "vase-shaped form," is found listed in nursery catalogues; this is, in reality, the true *U. americana*. Then too, there is the variety *pendula*, which has all the good qualities of *U. americana* with the addition of drooping branchlets, making it decidedly graceful. These and other forms should, of course, be asexually propagated in order to perpetuate their characteristic forms.

The slippery elm (*U. fulva*) is usually found over the same range as

the American elm but is not such an excellent ornamental and only grows about sixty feet high. Its form is round; its head, broad and somewhat open; and the foliage, not so dense as that of the American elm. From the mucilaginous inner bark of this tree, very popular cough drops were made at one time. The slippery elm is slightly more susceptible to elm leaf beetle injury than the American elm, and need never be used as a substitute for that much better tree.

The winged, or wahoo elm (*U. alata*) of the South is a vigorous growing, small tree with a wide-topped head, reaching a height of about thirty feet. The leaves are smaller than those of either of the elms already described, and there are pronounced broad and opposite corky ridges along the vigorous young branches. Sometimes the winged elm will grow in protected places as far north as Boston, but it is not dependably hardy north of Philadelphia. Where it can be grown, it makes a vigorous growing, small tree, often with graceful arching branches. It should be given preference to the American elm, however, only where a small sized mature tree is desired.

Three other elms, native in the United States, are seen occasionally in cultivation but these are not offered by nurseries because the trees have little to offer as ornamentals when compared with the more beautiful *Ulmus americana*. One is the cedar elm (*U. crassifolia*) of Texas, Mississippi and Arkansas. It is very common in these states but has been found to be of little value elsewhere in the United States. It is a somewhat round-headed tree, growing about 75 feet tall and having, like *U. alata*, opposite corky ridges along the twigs. Closely related is the red elm (*U. serotina*) native to Kentucky, Alabama and Georgia but hardy as far north as Boston. It has spreading, somewhat pendulous branches, forming a broad head; and it, too, often develops corky wings along vigorous growing twigs. These two elms and *U. parvifolia*, the true Chinese elm, are unlike all other hardy members of the genus in that they develop their flowers and fruits in the fall and not in the spring.

The last native elm species is the rock elm, *U. thomasi*, (formerly called *U. racemosa*). Though at present it is rarely grown, the tree might be valuable because of its unique growth habit. About 90 feet tall at maturity, it usually has a central trunk and irregularly developed short, lateral branches, giving an outline which is oblong, rounded at the top, but not necessarily dense. Its slow growth and loosely borne branches are probably the reasons why it has not been much utilized as an ornamental, but its growth habit makes it easily distinguishable, even at a distance, from the rest of the elms. It, too, fre-

quently develops irregularly corky wings along its younger branches.

So much for the native elms. Some are seen everywhere in the East and the Mid-west; and some of the less desirable ones have been left standing where the surrounding land has been utilized for building purposes. As stated before, the last three species mentioned are probably not grown in nurseries nor used in landscape work, but are seen here and there simply because they have remained untouched in areas where man has "developed" Nature's handiwork. The American elm is the best—far superior to the others in every way.

Asiatic Elms

Of this group, the elm which has caught the public fancy more than any other is the Siberian elm (*U. pumila*). This plant is a native of northeastern Asia. It is unfortunately misnamed the Chinese elm in many nursery catalogues though this name belongs to *U. parvifolia*. It was first sent to this country in 1905 by Professor J. G. Jack, of the Arnold Arboretum, and later was introduced in large quantities through the efforts of Frank N. Meyer, of the U. S. Department of Agriculture. The name Dwarf Asiatic elm, given to the plant in the first edition of "Standardized Plant Names," is unfortunate since it is a standard tree 75 feet tall—anything but dwarf. This vigorous growing tree has found much use in the drier areas of the Mid-west, where it does better than most other trees. It withstands clipping very well and forms dense hedges and windbreaks when properly clipped.

But when we have noted its drought resistance and its fast growth, everything in its favor has been said. It is a weak-wooded tree, does not grow old gracefully, and if unpruned, becomes very loose and open. Where other trees are available for ornamental purposes, they should be grown. This is especially true in the eastern and northeastern United States. Reports are circulating of certain strains of this tree with good form and habit, which yield similar off-spring when propagated asexually. I have seen several of these trees, which, when young, admittedly make nice specimens; but it is questionable that they will maintain their good habit as they grow older. For dry soil planting, especially in the dry areas of the West, or for a quick screen which later may be replaced with one more permanent, this tree is admirable; but as a permanent specimen in areas where other trees are available, it is not to be desired.

An elm frequently confused with *U. pumila* is the true Chinese elm (*U. parvifolia*) native of northern and central China, Korea and Japan. Like *U. pumila*, it has small leaves, 1 to 2 inches long. There are sev-



PLATE VIII

The native rock elm, *Ulmus thomasi*.

eral ways in which it differs from the taller growing Siberian elm, however. The true Chinese elm is a small tree, usually under fifty feet in height. It has thin scaling bark, and a round-topped crown, keeps its foliage green until late in fall and is half evergreen in the south. It bears its flowers in the fall while *U. pumila* has them in the spring. Usually, like the other elms, its autumn foliage is bright yellow; but two of the trees in the Arboretum have a bright red autumn coloration. It has been noted in the Japanese beetle area around Philadelphia, that where these two species were growing side by side, the beetles would practically defoliate *U. pumila* and scarcely touch *U. parvifolia*—an interesting observation well worth further investigation.

The Japanese elm (*U. japonica*) has long been a tree of importance to the Ainu, the aboriginal people of Japan. Many of these people believed that this was the first tree created, sent directly from heaven in full growth. This tree plays an important part in their economy. Fire is made by rubbing its dry roots together. When the inner bark of the tree is mashed and mixed with water, it is woven into a cloth from which wearing apparel is made. The outer bark is used in the roofing of houses and as covering for the outside (and the inside) walls. The Japanese elm is a handsome tree with good dark green foliage. It is as important ornamentally as the Scotch elm because of its similarity in general appearance. In the collection at the Arnold Arboretum, it is susceptible only to a very slight infestation of the elm leaf miner and the elm leaf beetle.

The fourth and last Asiatic elm, the Manchurian elm (*U. laciniata*) is of little importance ornamentally simply because it does not have a good habit of growth. All the trees in the collection at the Arboretum have a fan-shaped habit of branching, with a correspondingly rounded head, but the leaves are borne only at the tips of the long branches, which have very few side shoots. This plant has been offered in a few American nurseries but might well be replaced by some of the better elms.

European Elms

There are three elm species which, strictly speaking, are native of Europe only. They are the English elm *U. procera* (formerly called *U. campestris*), the Russian elm (*U. laevis*), and the lock elm (*U. plati*). Characteristic of the European elms as a group is the fact that they all assume their autumn color later in the fall than do the native American elms.

Of the three, the English elm is by far the most important in Amer-



PLATE IX

The European white elm or Russian elm, *Ulmus laevis*.

ica. Many of these trees were planted in Massachusetts in the eighteenth century and since that time have been continually used as street trees and specimens throughout the East. E. H. Wilson strongly recommended this tree for city planting for he claimed that it withstood the smoke and obnoxious gases of the city better than any of the other elms, the American included. It does not have the queenly arching habit of the American elm, but it does have a grace and beauty all its own, with its numerous ascending and spreading branches. It has also been noted that in good seasons the leaves remain green several weeks longer than do those of the American elm. Unfortunately it is most susceptible to attacks of the elm leaf miner and of the elm leaf beetle. In Massachusetts during the past summer, these pests were unusually numerous, and trees which had not been sprayed were practically defoliated by the end of July. Although many other elms, including the American elm, were victims this season, the English elm suffered particularly.

Several varieties of the English elm are known, but none of them are grown in quantity by American nurseries. The variety *vanhouttei* has leaves tinged with yellow, and *aurea* actually has yellow leaves. The variety *purpurascens* has purplish leaves, and another variety, *marginata*, has leaves with a creamy-white margin. One form, *australis*, has leaves that are much thicker and firmer than those of the species. Perhaps the best ornamental variety is *myrtifolia*, which has the smallest leaves of any of the elms—scarcely one inch long.

The European white elm or Russian elm *U. laevis*, (formerly *U. pedunculata*) is common in some parts of the Scandinavian Peninsula and Russia. It is similar in size to our own native American elm and is as hardy. However, it differs because it has a much thicker coating of tomentum on the undersurface of the leaves, and longer, more sharply pointed buds. In England, it grows better than the American elm. It is apparently rare in American collections, but makes an excellent specimen tree.

Another European species is the East-Anglian or lock elm, *U. plati*. The name lock elm was given to it in England because of the difficulty of working its tough wood. This tall growing tree, which reaches a height of 80-90 feet, is closely allied to the Scotch elm and is rarely found in American collections.

The next elm species to be mentioned is a hybrid, *U. hollandica*, apparently a hybrid of *U. glabra* and *U. carpinifolia*. There are a number of varieties but the one which well might represent this group is known as variety *major*, commonly called the Dutch elm. It is a tree of over

100 feet with a short trunk, wide-spreading branches, and lustrous dark green leaves. Other varieties have been planted to some extent in Europe as street trees, and a few have met with favor in America. The Belgian elm, *U. hollandica belgica*, is a tall, rough-barked tree with a straight trunk. Younger trees are dense and pyramidal in habit while older ones may be more or less cylindric. Trees of this variety in the Arnold Arboretum are apparently somewhat more hardy than typical *U. hollandica major*. The Klemmer elm (var. "Klemmer") has smooth bark, tall ascending branches, and a narrow pyramidal habit of growth. It originated in Belgium where it is planted a great deal. The Huntingdon elm (*vegeta*) originating about 1750 has been used in America and is valued for its height, its forked trunk, and its rough bark. A narrow pyramidal variety with smooth bark is *superba*, and still another variety, *pendula*, originating in England about 1830, has ascending branches but pendulous branchlets.

The elms, at least in the eastern part of the United States, are seriously threatened by the Dutch elm disease, about which every tree lover has read much. It is not my purpose to discuss this disease or its future potentialities, but I do want to plead for the cause of the elms. I believe that we should not stop planting elms simply because they may be subject to this disease. It is true that there are many other trees we can use in street tree planting, but none can compare with the American elm, and few have the distinctive forms characteristic of some of the varieties of the European elms. It is also true that they must be sprayed with lead arsenate to combat the elm leaf beetle. In very restricted areas, as around New York City, it may be advisable to discontinue the planting of elms, at least for the time being. However, I think the elms should be held in just as high regard as they always have been and that in New England, though adjacent to the Dutch elm disease area, we should continue to plant elms until that disease shows more pronounced signs of rapid spread.

Species Native of Both Europe and Asia

The last two species are native of Europe and western Asia, and are used a great deal in the United States because of their good ornamental characters and their several horticultural forms.

The first is the smoothleaf elm *U. carpinifolia*, (formerly called *U. foliacea* or *U. nitens*). Being used to a great extent in this country, it is constantly confused with the English elm, *U. procera*, (*U. campestris*), from which it may be distinguished by its less deeply furrowed bark, mostly glabrous branchlets, longer and often obovate leaves which are

lustrous and usually smooth on the upper surface with petioles from $\frac{1}{4}$ to $\frac{1}{2}$ inch long. Unfortunately, the seeds of this tree have been sold for years by European seedsmen as *U. campestris*; consequently, the resulting confusion in this country has been inevitable.

The smoothleaf elm, which may reach a height of 90 feet, and is quite variable in growth habit, has many horticultural forms, some of which are available from nurseries in this country. This tree usually is pyramidal in outline, having a single trunk and somewhat ascending branches, although sometimes the branches may be pendulous and the head more or less rounded. In the south of England, it is often referred to as the Herfordshire elm, and grows with a broad head and rather pendulous branches, surpassed in beauty only by the American elm as it grows in New England. The pendulous branched form (*pendula*) has been offered by American nurseries. An unusual variety is *webbiana*, of little horticultural value because, even though the tree is narrow and pyramidal with ascending branches, the leaves are folded longitudinally, giving the appearance of wilting. Another form, *variegata*, has its leaves blotched with two shades of green and with white; and though not particularly desirable, it is of interest to those who like trees with variegated leaves.

Eight other varieties of the smoothleaf elm have horticultural significance, six of them being offered in American nurseries. Both the Cornish elm (*cornubiensis*) and the Wheatley elm (*sarniensis*), incorrectly called *wheatleyi*, though also known as the Guernsey or Jersey elm, are narrow, pyramidal trees with dense, erect branches. The Wheatley elm, almost columnar in habit, has a slightly broader head and wider leaves than the Cornish elm, with branches more stiffly erect. The variety *dampieri* is a fastigate tree with a very narrow, pyramidal crown and deeply double-toothed leaves; *credi* is similar but its leaves are yellowish. Another variety, named *suberosa*, is little more than a dense shrub, irregularly cylindric in outline, the young sucker branches of which frequently develop opposite corky wings. Somewhat similar to *suberosa* is the variety *propendens*, the branches of which are pendulous, however, and its leaves are very small, only being about one inch long. An outstanding elm was sent to Germany from Persia in 1878 and has since been named the variety *umbraculifera*. This is a dense growing, small tree with a globose, or sometimes flat top and erect branches. Closely associated to it is the variety *koopmanni*, which is definitely more globose in outline but just as dense. Trees of these two varieties in the collection at the Arnold Arboretum are well clothed with branches from top to bottom.



PLATE X

Two varieties of the smoothleaf elm, *Ulmus carpinifolia*. On the left var. *umbraculifera*, on the right var. *koopmanii*.

These unusual forms are not to be desired in preference to other more ornamental trees and shrubs in the landscape, but they do have a definite use. Sometimes there is a place in a large planted area for a small tree with a definite outline—something which does not require constant pruning to keep it in shape. These varieties of the smooth-leaf elm supply just such an accent point. Indiscriminate use of these trees, however, should be guarded against.

The other elm species which is native of Europe as well as certain parts of western Asia, is the Scotch, or Wych elm, *U. glabra*, sometimes formerly called *U. montana* or *U. scabra*. This tree, with wide-spreading branches and often flat-topped head, is used considerably in America as an ornamental. The dark green leaves, sometimes with two or three points near the apex, are broader beyond the middle, very rough above, and downy underneath. The petioles are about $\frac{1}{8}$ inch long. Unlike many of the other elms, this one does not produce suckers; and, on account of this good trait, it has been used much as an understock in grafting. Unfortunately, it is one of the first elms sought by the elm leaf beetle, and in locations where there are several varieties, the beetle does more injury to this tree than to most of the others.

This elm can always be distinguished from other European elms by the fact that the seed is in the middle of the fruit, the petioles are very short, the upper surface of the leaves is rough, and there is an absence of corky ridges on the two-year branches. The specific name *glabra* comes from the fact that the branches are very smooth, not rough like most of the other elms.

A number of varieties of this are grown. The most popular is the Camperdown elm (*camperdowni*) which, when grafted on an upright stem, has a wealth of pendulous branches forming a globose head. Many such trees can be seen even in this country, forming natural arbors under which chairs and tables are placed. Another form (*pendula*) has rather horizontal branches with pendulous branchlets and grows into a low flat-topped tree. There is a fastigate variety, called the Exeter elm (*exoniensis*, formerly *U. montana fastigiata*), with rather small, often wrinkled leaves, but with branches rigidly upright. One variety (*purpurea*) has leaves which are purple in color when they are young; another variety (*atropurpurea*) retains the color in the leaves for a longer period. A compact shrub with smaller leaves is the variety *monstrosa*. A lower growing bush is *nana*, which seldom grows over 6 feet tall. Sometimes this bush elm is grafted 6 feet up on the trunk of *U. glabra*, resulting in a dense, compact, round-headed tree. A

curious, slow-growing form with leaves that are narrow and crinkled is called *crispa*—used sometimes because of its queer foliage.

The Key

The following key is offered as an aid to the identification of elm species on the basis of foliage characters. More exact keys have been made, in which the flowers and fruits are used, but many an amateur is confronted with the perplexing problem of identification when flowers and fruits are not available; hence this key. Every one of the elm species varies greatly, and to make a key using only one or two characters is not very satisfactory. Therefore, this key is not infallible, but it may serve its purpose to many who are perplexed concerning the identification of these elms.

To the individual not familiar with the use of keys, this may at first seem confusing, but careful study will prove its simplicity. For instance, all elm species fall into one of four groups (marked by the figure 1), because of corky ridges on the branches, or leaves with several points at the apex, or leaves simply serrate, or leaves doubly serrate. To place a plant in one of these four groups, these four characteristics should be used *in this sequence*. Once done, the remaining points should be taken up in the particular group, *in the sequence suggested in the key*. Identification will be aided materially if the habitat of a tree is known. For instance, in the first group (corky ridges on the branches) *Ulmus crassifolia* would not be found in northern Minnesota, nor would it be likely that *U. procera* and *U. japonica* would be found growing wild in the woods.

Be certain that the tree is examined carefully for all possible marks of identification, and that many leaves are examined since one alone would not tell the full story.

It should be noted that this key does not take into consideration the varieties of these species, many of which can be identified by their form alone. Also, and this is very important, it should be noted that the following species are not common in America except in botanical collections: *U. japonica*, *laevis*, *plati*, and that other species, like *U. thomasi* and *serotina*, are used very little in landscape work. A knowledge of these facts should make this key much more usable.

The elms are so variable that it is likely they will continue to be difficult to identify for many years to come. These notes and suggestions are offered merely as aids to those interested in this group of trees.

ABBREVIATED FOLIAGE KEY TO COMMON ELM SPECIES

1. Corky ridges or wings on younger branches

- 2. Leaves simply serrate *Ulmus crassifolia*
- 2. Leaves doubly serrate
 - 3. Young twigs glabrous or nearly so
 - 4. Wings usually two and opposite *U. alata*
 - 4. Wings several, not necessarily opposite, flowers in spring, not native *U. carpiniifolia suberosa*
 - 4. Wings several, not necessarily opposite, flowers in fall, native *U. serotina*
 - 3. Young twigs pubescent
 - 4. Tree irregularly columnar *U. thomasi*
 - 4. Tree not irregularly columnar, oval or rounded in outline
 - 5. Leaves 2-3" long, wings occasionally *U. procera*
 - 5. Leaves 3-4.75" long, wings occasionally *U. japonica*

1. Leaves three pointed at tip or occasionally so, branches not corky

- 2. Mature branches reddish brown, hairy while young; leaves occasionally with one or two extra points at apex *U. glabra*
- 2. Mature branches pale yellowish or grayish brown, glabrous or nearly so when young; most of the leaves three-pointed at apex *U. laciniata*

1. Leaves simply or nearly simply serrate, 0.75-2.75" long

- 2. Leaves often nearly equal at base, many leaves showing indications of double serration, young branches pubescent or glabrous, stipules broad, flowers in spring *U. pumila*
- 2. Leaves usually unequally rounded at base, young branches pubescent, stipules linear, flowers in fall *U. parvifolia*

1. Leaves doubly serrate

- 2. Young branches glabrous
 - 3. Leaves 2.75-6" long

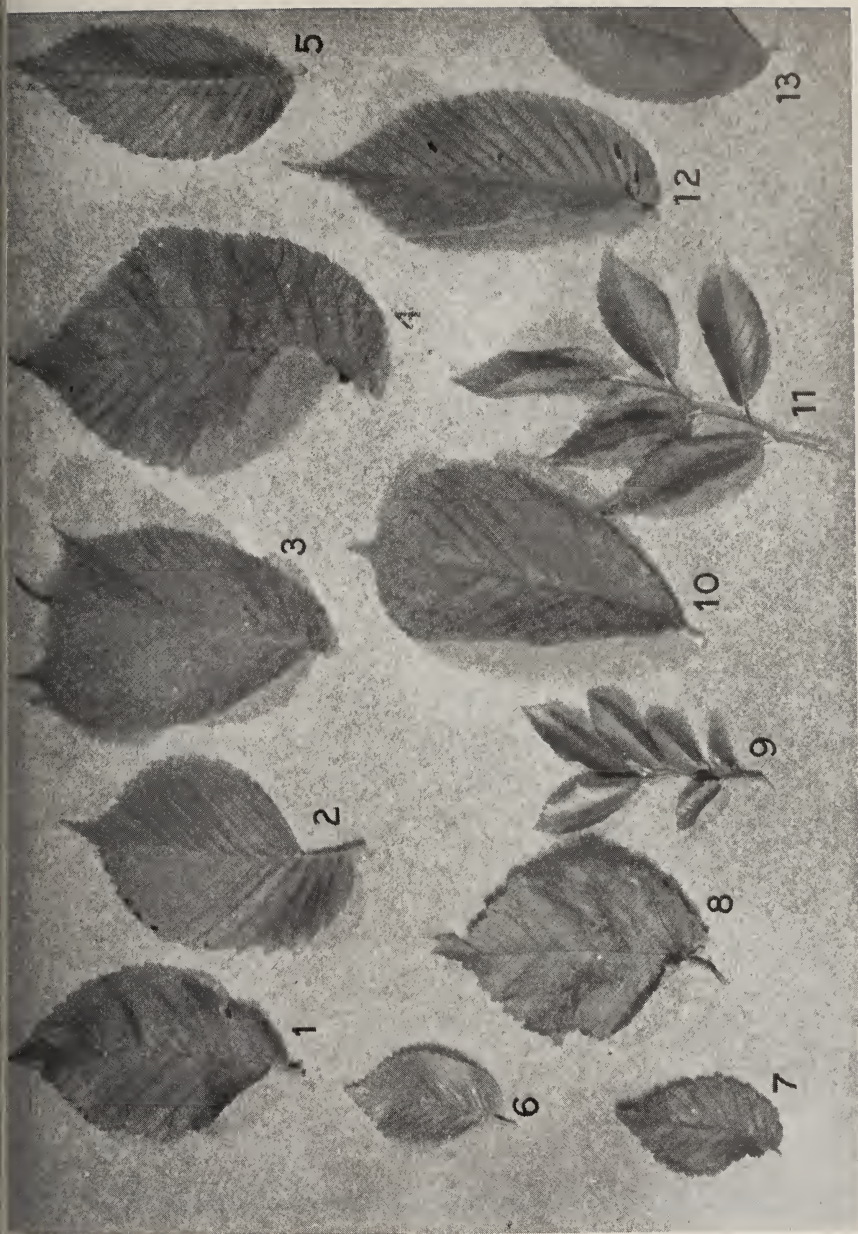


PLATE XI. Leaf specimens of various elm species showing the variation in size and form.

1. *U. hollandica major* 2. *U. laevis* 3. *U. laciniata* 4. *U. glabra* 5. *U. americana* 6. *U. carpinifolia*
 7. *U. procera* 8. *U. plati* 9. *U. parvifolia* 10. *U. japonica* 11. *U. pumila* 12. *U. fulva* 13. *U. thomasi*

4. Leaves usually twice as long as wide, no conspicuous axillary tufts of hair *U. americana*
4. Leaves less than $1\frac{1}{2}$ times as long as wide, usually with conspicuous tufts of hair in axils of veins on under surface of leaves, considerably variable *U. hollandica*
3. Leaves 1.25-3.25'' long
 4. Petioles 0.25-0.5'', leaves 2-3'', smooth above *U. carpinifolia*
 4. Petioles less than 0.25'', leaves 1.25-2.25'', slightly scabrous above *U. plati*
2. Young branches pubescent
 3. Leaves often glabrous beneath *U. americana*
 3. Leaves pubescent beneath
 4. Leaves 2-3'' long *U. procera*
 4. Leaves longer
 5. Leaves often widest at middle, 4-8'' long
 6. Branchlets grey to light brown, buds covered with rusty brown hairs *U. fulva*
 6. Branchlets dark brown, buds without rusty brown hairs, leaves sometimes showing a tendency to be three pointed at tip *U. glabra*
 5. Leaves usually widest above middle, 2.5-4.75'' long
 6. Leaves scabrous and pubescent above, corky wings on branches occasionally *U. japonica*
 6. Leaves usually glabrous above, very unequal at base *U. laevis*

DONALD WYMAN

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These Bulletins will be discontinued until spring of next year.

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